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TYDSKRIF VAN DIE SUID-AFRIKAANSE VETERINÊRE VERENIGING

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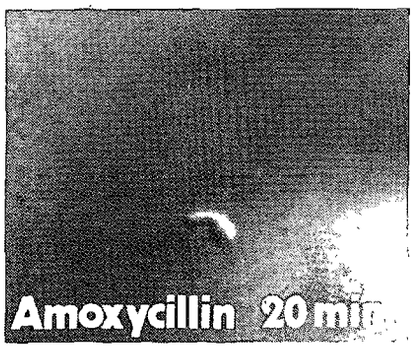

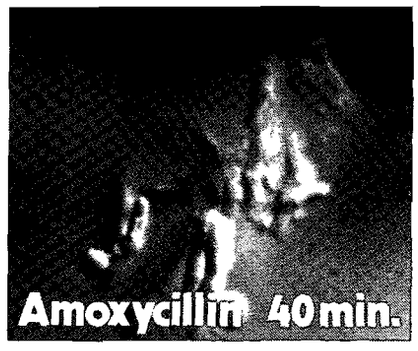

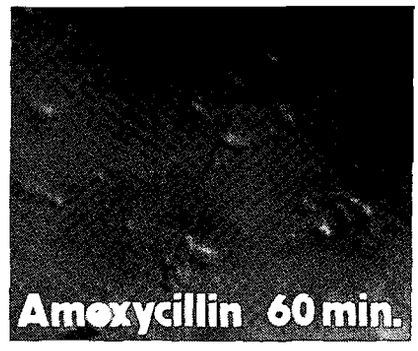

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SUSPECTED HYBRID VETCH (*VICIA VILLOSA* CROSSED WITH *VICIA DASYCARPA*) POISONING OF CATTLE IN THE REPUBLIC OF SOUTH AFRICA

G.W. BURROUGHS,* J.A. NESER,** T.S. KELLERMAN*** and F.A. VAN NIEKERK****

ABSTRACT: Burroughs G.W.; Neser J.A.; Kellerman T.S.; van Niekerk F.A. **Suspected hybrid vetch (*Vicia villosa* crossed with *Vicia dasycarpa*) poisoning of cattle in the Republic of South Africa.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 75-79 (En) State Veterinarian, Private Bag X3916, 6056 Port Elizabeth, Republic of South Africa.

A description of the clinical signs and pathological changes is given of 2 outbreaks of suspected hybrid vetch poisoning in the Humansdorp district, Republic of South Africa. These were characterised by a severe dermatitis, high morbidity and mortality in older cows. Microscopically granulomatous lesions occured in the kidneys. liver, myocardium, spleen and skin. Variable numbers of multinucleated giant cells and eosinophils were seen in these lesions. Acute multifocal hepatic necrosis was observed in 2 animals. Brief comparisons are made with outbreaks of vetch poisoning in other parts of the world.

Key words: Cattle, vetch poisoning, dermatitis, granulomatous.

INTRODUCTION

Hairy vetch (*Vicia villosa* Roth) is a legume widely cultivated throughout the world in countries with a temperate climate, including the United States of America (USA)[2]. It is often planted as an artificial pasture in combination with grains or harvested as hay for winter feeding[2]. In the Republic of South Africa (RSA), vetch has, to the best of our knowledge, only been planted on a small scale. In the Humansdorp district of the Cape Province, for instance, vetch pastures were established on a few isolated farms mainly on an experimental basis, occasionally with unfortunate results.

Poisoning of cattle with *Vicia* species can take on different forms[1 2]. The seeds and vegetative portions of various species have been reported to contain cyanogenic glycosides as well as substances which cause toxic hepatitits or haemolytic anaemia[1]. The faba bean (*V. faba L*), has been incriminated as a cause of acute haemolytic crisis in certain human populations with genetic erythrocyte defects[1]. Photosensitization can result from ingestion of common vetch. (*V. sativa L*)[1]. Furthermore, 3 apparently different syndromes have been reported in cattle grazing on hairy vetch[1 2]. The first was characterized by an acute onset of nervous symptoms including bellowing, sexual excitement, locomotor disturbances and convulsions followed by death. This was seen in mature dairy cows after ingestion of a mixture of rye and hairy vetch seed. The second syndrome was associated with subcutaneous swellings of the head, neck and body, alopecia, cyanosis, purulent nasal discharge, coughing, dyspnoea and a low mortality rate. Death occurred after about 12-15 days illness. The third syndrome, described by Panciera et al.[1] occured in cattle that had access to pastures containing hairy vetch in the USA[1 2]. Clinical signs usually commenced from 2-6 weeks after animals were introduced into the vetch pastures. The morbidity rate could be as high as 35 %, while mortality ranged from 0-100 %. Severe exudative to ulcerative dermatitis accompanied by severe pruritis, conjunctivitis, dyspnoea, and severe diarrhoea with occasional abortions were the most important clinical signs.

Grey to yellowish-grey, well to poorly demarcated, multifocal to diffuse lesions were found in many organs. Histopathological changes consisted of striking lymphoreticular, plasma cell, eosinophil and multinuclear giant cell infiltrations in many organs[1 2].

This is the first report of suspected vetch poisoning in cattle in the RSA. The clinical signs and pathological lesions are described.

HISTORY OF OUTBREAKS

Two outbreaks of suspected vetch poisoning in cattle were investigated in the Humansdorp district of the Eastern Cape Province (RSA) during September 1981 and October 1982. The outbreaks occurred on 2 neighbouring farms where both Friesland and Friesland-cross heifers and older cows had access to camps containing lush growths of vetches and smaller quantities of rye grass (*Lolium perenne*) pastures. This particular variety of hybrid vetch was certified by a seed merchant as being *V. villosa* crossed with *V. dasycarpa*. The cattle developed dermatitits and diarrhoea (often with fatal results) after devouring large quantities of vetch.

In the first outbreak in 1981, where almost half of the 46 cows on the farm were Friesland cattle, 6 Friesland cows older than 5 years and 2 younger cows became ill. Of these, 4 older cows died while the 2 younger cows, with milder skin lesions, survived. During the second outbreak in 1982, 14 cows (5-15 years old) and 1 heifer out of 22 Friesland crosses on a neighbouring farm became sick. Twelve of these died while 2 of the cows and the heifer recovered.

A small number of *Senecio* plants which were later identified as potentially toxic species were also noticed in the pastures. These were *S. burchellii, S. ilicifolius* and *S. rigidus* (Joubert J.P. 1981 Veterinary Research Institute, Onderstepoort, personal communication).

CLINICAL SIGNS

The period between initial exposure of the cattle to the plant and the commencement of clinical signs in the first

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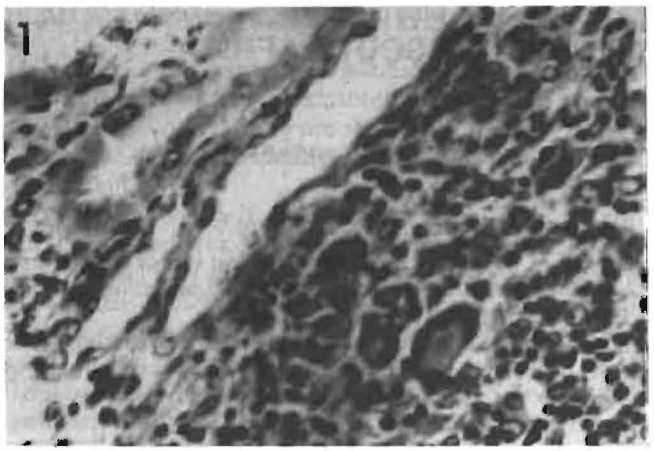

Fig. 1 Kidney. Focus of mononuclear cells and giant cell adjacent to necrotic tubule. HE X 400

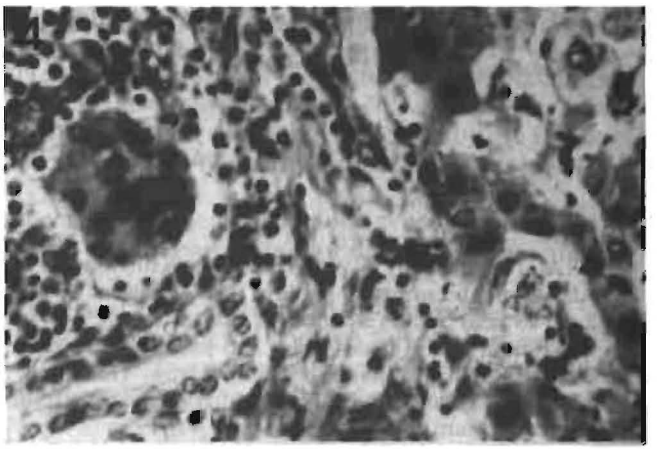

Fig. 4 Liver. Focus of mononuclear and giant cell infiltration in portal tract. HE X 400

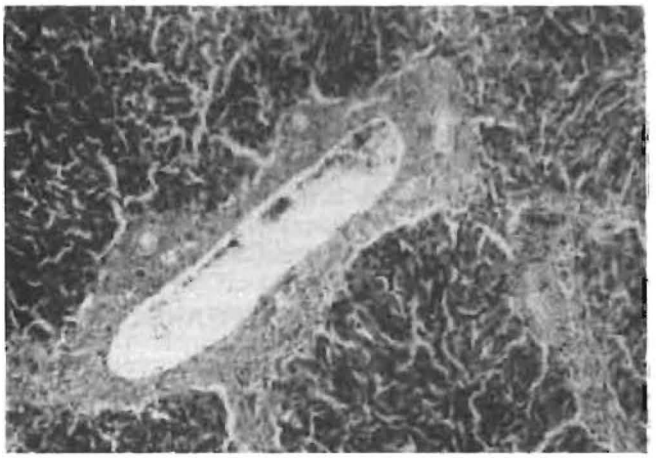

Fig. 2 Liver. Severe portal fibrosis with bridging and focal infiltrations of mononuclear cells. HE X 200

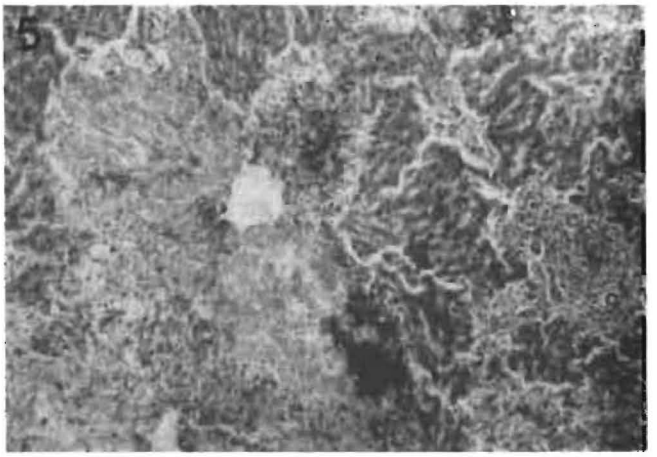

Fig. 5 Liver. Multifocal to paracentral necrosis and haemorrhage. HE X 160

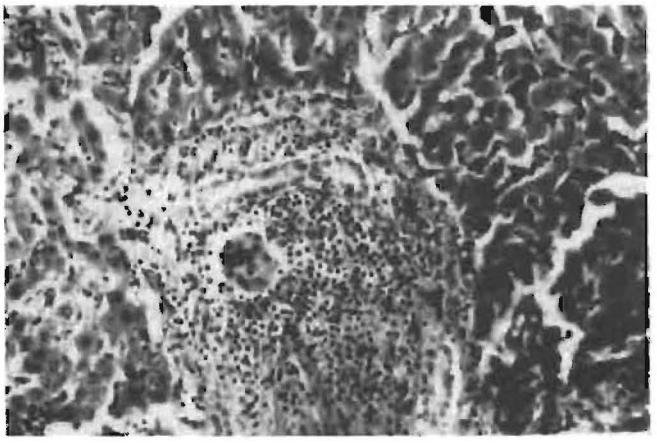

Fig. 3 Liver. Focus of mononuclear and giant cell infiltration in portal tract. HE X 200

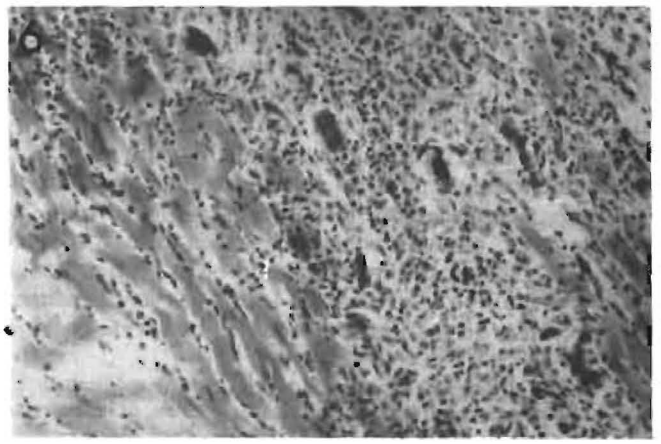

Fig. 6 Myocardium. Foci of fibroplasia, mononuclear and giant cell infiltration. HE X 200

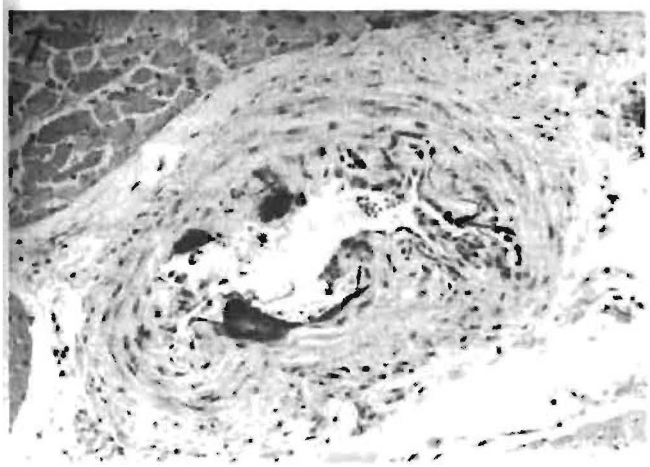

Fig. 7 Small artery in myocardium. Subintimal mineralized plaques sometimes extending partially into the tunica media. HE X 200

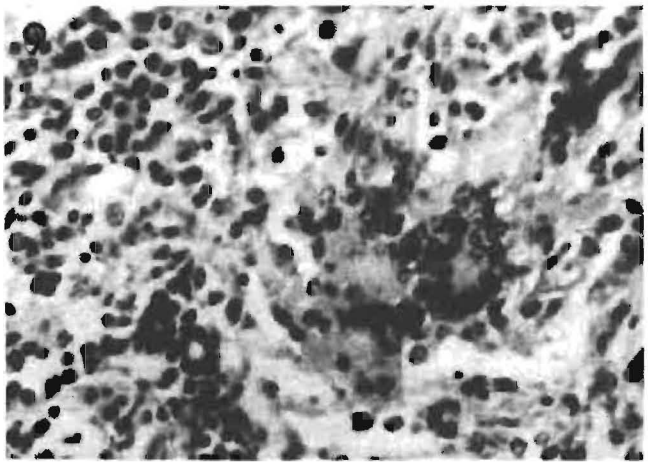

Fig. 9 Spleen. Focal granulomatous nodule within centre of Malphigian bodies composed of reticuloendothelial cells, fibroblasts and few giant cells. HE X 400

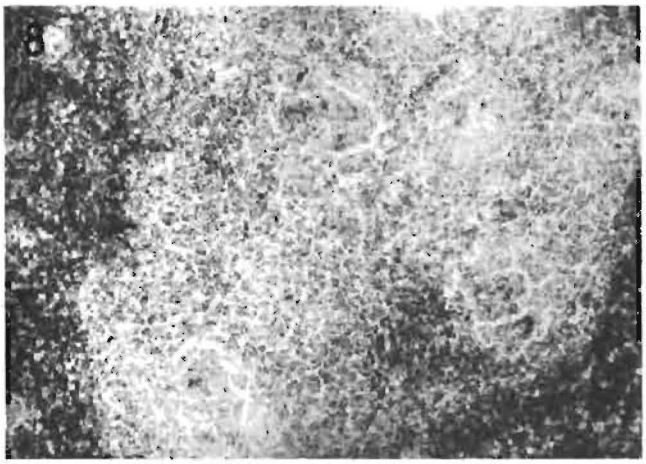

Fig. 8 Spleen. Circumference of Malphigian bodies enlarged. HE X 160

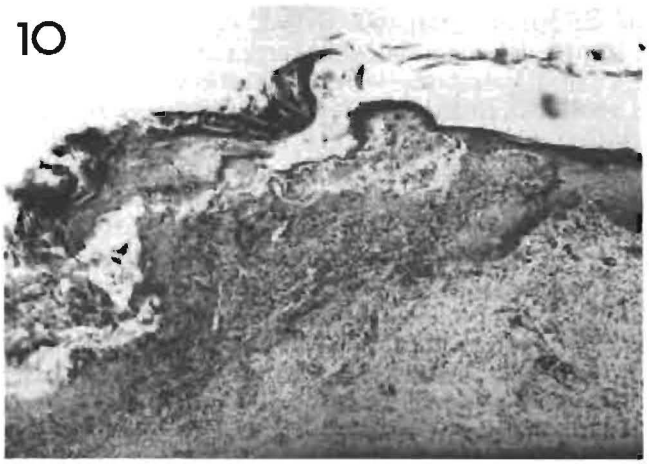

Fig. 10 Skin. Ulceration hyperkeratosis and cellular infiltration into the dermis and epidermis. HE X 160

outbreak is not known. However, the first signs during the second outbreak were seen about 1 month after cows had started grazing vetch pastures. Most of these cows were visibly ill for 1-2 weeks before dying, but a few lived for about 1 month. Two mildly affected young cows that survived the first outbreak had lesions only on their faces, necks and udders. After approximately 5 weeks they regained their condition but their milk production did not recover, and they still suffered from pruritis.

The most prominent clinical signs during both outbreaks were severe dermatitis and pruritis. Their coats became roughened and small thickened areas developed in the skin which later coalesced to form larger plaques and more diffuse lesions. Serum exuded from the affected skin to form crusts which on removal exposed red eroded epithelial surfaces. The skin then became inelastic, thickened, cracked, wrinkled and hairless. Lesions first appeared on the chin of the animals and later on the face, perineum, escutcheon, tail-root, udder and teats. They then spread to the neck, trunk and limbs. Some cows showed submandibular oedema. Black areas of the skin were as severely affected as white areas. In some animals the prescapular lymph nodes were enlarged.

In most of the animals there was a diarrhoea which sometimes tended to be haemorrhagic. During the second outbreak, blood clots were passed in the faeces of 2 animals. Other symptoms included conjunctivitis, salivation and a mucopurulent nasal discharge. There was laboured breathing and coughing in all the animals, and at times it appeared as if they were gasping for breath. Cows had a good appetite despite their illness, and only developed anorexia about 2-3 days before they died. Their condition and milk production, however, deteriorated markedly.

PATHOLOGY

Macroscopical pathology

The macroscopical lesions of only one typical case from the second outbreak are described. The kidneys were enlarged, with a mottled appearance due to numerous greyish-yellow almost coalescing foci. On cut surface, these foci were found throughout the cortex. There were greyish-yellow streaks on the entire epicardium stretching about 5 mm into the myocardium. Other changes included dehydration and emaciation, haemorrhages of the duodenum and ileum as well as patchy hyperaemia of the large intestine.

Microscopical pathology

Skin, myocardium, spleen, liver, kidney and lung specimens were fixed in a 10 % buffered formalin solution for histopathological examination. Tissues were processed in a routine manner, and sections were cut at 6 microns, and stained with haematoxylin and eosin (HE). In addition, the following special staining techniques were applied to liver, heart, kidney and spleen sections. Gram's and Ziehl Neelsen's methods for bacteria, Gomori's methenamine silver nitrate (GMS) and the periodic acid-Schiff reaction (PAS) for fungi; Oil Red O method for lipids or mineral oil substances; Perl's and Schmorl's methods for haemosiderin and lipofuscin pigment respectively as well as the Masson's trichrome method for collagen.

In the kidneys multiple small to larger foci of interstitial monocytic and lymphocytic (mononuclear cells) infiltrations were widely distributed through the cortex. In some of the larger foci single or small numbers of giant cells and eosinophils as well as mineralized necrotic tubules were conspicuous among the mononuclear cells (Fig. 1). Most of the parenchymal cells showed cloudy swelling and hydropic degeneration, while some tubular cells in most severely affected areas were necrotic. Endothelial cells in a number of smaller arteries in these foci were markedly swollen and hyperplastic. In some of the vessels, the smooth muscle cells in the tunica media appeared swollen and slightly vacuolated, while variable numbers of mononuclear cells were present in their lumens.

In the liver, severe portal fibrosis with bridging as well as focal infiltrations of mononucclear cells and small numbers of eosinophils and giant cells in the triads were the most prominent change (Fig. 2-4). Slight proliferation of bile duct epithelium was present in one case. Hepatocytes showed anisonucleosis, cloudy swelling and hydropic degeneration. Single cell and isolated small foci of hepatocellular necrosis were scattered throughout the parenchyma. In 2 cases, however, (one from each outbreak) there was severe multifocal to paracentral necrosis and haemorrhage (Fig. 5). Lipofuscin and haemosiderin pigments were present in variable amounts, in the cytoplasm of hepatocytes, Kupffer cells and macrophages in the portal tracts. A mild to moderate mononuclear cell leucostasis was present in the sinusoids.

Numerous small to larger disseminated foci of fibroplasia and/or mononuclear cell infiltration were found in myocardium (Fig. 6). Small infiltrates were mainly confined to the interstitial tissue, while larger foci were associated with extensive proliferation of granulation tissue as well as degeneration and necrosis of myocardial fibres. Some of the necrotic fibres showed evidence of mineralization. Granulation tissue was infiltrated by several giant cells and eosinophils (Fig. 6). Subintimal mineralized plaques sometimes extending partially into the tunica media were seen in a few of the smaller arteries in the animal which revealed mineralization of necrotic myocardial fibres (Fig. 7). Other vascular changes included proliferation of endothelial cells as well as oedema and mild fibroplasia of the intima.

The circumference of Malphigian bodies in the spleen was enlarged (Fig. 8). One or more focal granulomatous nodules composed mainly of reticuloendothelial (RE) cells, some fibroblasts and few giant cells were distributed throughout the white pulp (Fig. 9). Apart from these localized proliferative lesions, the RE cells in the remainder of the white pulp appeared to be increased. A few eosinophils were scattered throughout the white pulp. Other changes included severe congestion and haemosiderosis of the red pulp. Fibrous tissue in the portal tracts of the liver, interstitium of the kidneys as well as in the granulomatous reactions in the spleen and myocardium gave positive reactions with the Masson's trichrome stain for collagen.

Skin specimens from one animal were examined. The subacute to chronic multifocal ulcerative dermatitits was characterized by hyperkeratosis and moderate oedema and pronounced fibrosis of the dermis. Infiltrations of large numbers of lymphocytes, neutrophils and moderate numbers of eosinophils were also present in the dermis (Fig. 10).

Lung specimens received from 2 animals, showed few significant changes except for slight endothelial hyperplasia in smaller arteries. Smooth muscle cells in the tunica media also appeared swollen and the cytoplasm was slightly vacuolated.

No bacteria, fungi, lipids or polysaccharides could be found in the skin, liver, kidney, myocardium and spleen sections stained with the different special stains.

TREATMENT

The administration of antibiotics, liver supportive drugs, intravenous glucose solution, vitamins A, E and B complex, comprized the parenteral treatment. Skin lesions were treated topically with Healing Oil (Milborrow SA) and animals kept in the shade. An apparent improvement resulted from this treatment, but the final survival rate was very low.

DISCUSSION

Panceira et al.[2] were unsuccessful in their attempts to induce this condition experimentally by forcing 3 head of cattle to graze a pure stand of vetch for 28 days. This finding supported their observation that thousands of cattle annually consumed hairy vetch pastures without ill effect. According to them, no attempts to isolate and identify a responsible toxic agent have been documented. Evidence to incriminate *V. villosa* in this syndrome therefore, remains circumstantial[2].

There are also reports in the literature which indicate that insects which parasitize the plant may be involved in vetch toxicosis syndromes[2]. However, both outbreaks of suspected *Vicia* spp. poisoning occurred during spring when the pasture was well grown, lush, apparently healthy, and free of aphids as well as other parasites. The possibility that insects play a role in this toxicosis is therefore doubtful. Of all the known syndromes resulting from vetch poisoning, the third disease described by Panciera et al.[1 2] is closest to the one examined by us. The 2 diseases were, indeed almost identical. It would also appear that hybrid vetch from Humansdorp is at least as toxic as *V. villosa* Roth, judging from their similar latent periods, morbidities and mortality rates.

From our observations, animals older than about 3 years seem to be especially susceptible, since younger animals showed milder skin lesions and had a higher survival rate. This agrees with the findings of Panciera et al.[1 2] in the USA. During both the South African outbreaks, Friesland or predominantly Friesland cross bred animals were the only ones to become visibly affected despite the high percentage of non-Frieslands in the herd involved in the first outbreak. In the USA, Panciera et al.[1 2] reported this condition in 11 Holstein Friesland

and 12 Aberdeen Angus herds, which seems to indicate at least some degree of breed predisposition.

The symptoms and pathological changes seen in the Humansdorp cattle were almost indistinguishable from those described for hairy vetch poisoning in the USA[1,2]. The microscopical changes in the livers were very similar but, in addition, in 2 of our animals, multifocal coagulative necrosis was present throughout the parenchyma. Based on the eosinophils and multinucleated giant cells in the portal triads and in the necrotic foci, a *Fasciola* spp infestation was initially suspected, but no parasites could be found in liver sections. However, in both cases macroscopic skin lesions similar to those described in the other animals were observed. Furthermore, microscopical renal changes compatable with vetch poisoning was also seen in one of the 2 animals.

Vetch poisoning would seem to affect a wide range of organ systems and tissues including skin, kidneys, liver, myocardium, spleen, lymph nodes, adrenals, thyroid, pancreas, salivary glands, intestines and endometrium[1,2]. The presence of eosinophils and multinuceated giant cells in these tissues seems to be of diagnostic significance. Giant cells usually characterize granulomatous inflammatory reactions caused by certain fungi, bacteria, parasites or foreign materials such as mineral oils or complex polysaccharides[3]. Eosinophils have often been associated with parasitic infestations[4]. However, special histological staining methods for infectious agents or foreign materials were negative.

The conditions under which these outbreaks of hybrid vetch poisoning occurred, the clinical signs as well as the macroscopical and microscopical changes closely resemble the cutaneous and visceral form reported for hairy vetch poisoning[1,2].

Care should also be taken to distinguish vetch poisoning from photosensitization especially in areas such as Humansdorp where facial eczema is known to occur.

ACKNOWLEDGEMENTS

Dr. I.B. van Rensburg of the Department of Pathology, Faculty of Veterinary Science, University of Pretoria is thanked for kindly making available the histopathological specimens of one animal. The staff of the sections of Pathology and Photography, Veterinary Research Institute, Onderstepoort are also thanked for preparing the histopathological sections and photomicrographs respectively and Mrs R. Coetzer for typing the manuscript.

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BOOK REVIEW BOEKRESENSIE

PROBLEMS IN SMALL ANIMAL NEUROLOGY

CHERYL L. CHRISMAN

Lea & Febiger, Philadelphia. 1982 pp 461, Figs 115 (1 colour), Tables 69, Price R85,30.
(ISBN 0-8121-0811-6).

This book is a must for all veterinary students and veterinary practitioners with an interest in small animal neurology. It is written in a clear, concise and practical way with a minimum amount of background theory. In keeping with the trend set by young American veterinary academicians the book is written in a problem solving style. Following introductory chapters on neuro-anatomy, physiology, the neurologic history and examination there are 14 chapters dealing with specific commonly encountered neurological syndromes. Each of these chapters begins with a diagrammatic representation of the site(s) of the lesion, as well as an extensive differential diagnosis list. Specific points in the history, neurologic and special examinations pertaining to the syndrome are then discussed followed by detailed descriptions of each of the conditions listed in the differential diagnosis. This format provides an extremely rapid reference system for busy practitioners suddenly confronted by a neurological disorder, and can only assist them in arriving more quickly at a more accurate diagnosis. I heartily recommend this book as a practical and useful guide in a difficult area of small animal veterinary practice.

P. Bland van den Berg

AN ACCOUNT OF PROBLEMS EXPERIENCED DURING THE SHIPMENT OF CATTLE FROM THE UNITED STATES OF AMERICA TO SOUTH AFRICA

C.C. KINGSLEY*

ABSTRACT: Kingsley C.C. **An account of problems experienced during the shipment of cattle from the United States of America to South Africa.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 81-82 (En) 13 Eagle Road, Selcourt, 1560 Springs, Republic of South Africa.

A group of 26 cattle was shipped from Houston, Texas to Cape Town. Inadequate preparation of the cattle for the voyage, poor feed and poor crate construction resulted in stress-induced respiratory disease and mortality. Measures to avoid unnecessary stress when shipping cattle are discussed.

Key words: Cattle shipment, transport, stress-induced respiratory disease, pneumonia.

During January 1983 I was given the opportunity of accompanying a group of cattle being shipped from the United States of America to South Africa. The animals included 20 heavily pregnant Red Angus heifers and cows, one Red Angus bull and 5 Brahman bulls.

On 5 January I flew to Houston, Texas, equipped with what I considered to be necessary for the care of the cattle on the voyage home. Included were sufficient instruments to perform caesarian sections and to relieve dystocias, and drugs such as, local anaesthetic, xylacine hydrochloride (Rompun, Bayer), oxytetracycline hydrochloride (Liquamycin, Pfizer), procaine penicillin and dihidrostreptomycin sulphate (Streptopen, Milvet) and pessaries for intrauterine administration.

The cattle arrived in Houston by truck on 6 January. The Brahmans came from various farms in Texas and the Red Angus from Iowa, about 1 950 km (1 200 miles) to the north. A number of the Red Angus cows had frost-bite lesions on their ears and tails. The affected tissues sloughed later on the trip. In Houston the cattle were held for a day in pens used for animals awaiting export.

Early on the morning of 7 January I accompanied the cattle and their feed to the Houston harbour, where the cargo ship on which we were to sail, had just docked. It took all morning to transfer the cattle from the truck into crates, and to load the crates and feed on board. Although it was the middle of winter, the weather in Houston was warm, and by the time the animals were aboard, the Red Angus were all panting with mouths open and tongues protruding.

The animals were housed in their crates as follows: Cows – 3 per crate; large bulls – 1 per crate; smaller bulls – 2 per crate. For the smaller bulls the crates were divided in half.

The crates measured about 3 m². They had solid wooden floors, wooden sides with an opening in front and ventilation slits at the top, and solid wooden roofs. Feed purchased for the trip included hay, which was of a very poor quality, being coarse and dusty, and concentrate (horse and mule feed), which consisted mainly of whole, unrolled barley and oats, and proved to be very indigestible.

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The animals were given water, bedding, and hay that afternoon. The water was provided to the animals in household buckets, 2 per crate, which required filling about 10 times a day.

The ship sailed that night, and by morning we were in the Gulf of Mexico. During the course of the first day at sea certain problems become evident:

1. The crates, which were situated on the deck at the stern of the ship, were protected from any breeze.
2. The solid floors of the crates drained very poorly and, if they were not covered with a thick layer of bedding, became extremely slippery.
3. The day and night temperatures were very high and would rise even more. The Red Angus cattle, used to freezing conditions, were unable to cope with the heat. They stood in their crates panting, with tongues protruding. Their rectal temperatures were over 40°C, some as high as 41,5°C.

With the help of members of the crew, I removed some of the boards from the sides of the crates to improve the ventilation. Spraying the animals down thoroughly with fresh water provided them with temporary relief, and they would then eat or ruminate.

In an effort to keep them cool, they were hosed down each time the water buckets were filled. Wetting the bedding caused it to start decomposing, generating heat and ammonia, which made it necessary to change it very regularly.

On the second day some cows had mucoid nasal discharges. Over the next few days the condition spread to all the Red Angus cattle. The discharge became more copious and purulent. Most of the animals were coughing and showed various degrees of dyspnoea. The insides of their nostrils became very hyperaemic and, in some cases, eroded. All the cattle that showed severe symptoms were treated with daily intramuscular injections of oxytetracycline hydrochloride. The condition of one heifer continued to deteriorate. She became totally anorectic and showed very severe dyspnoea. In addition, the purulent nasal discharge contained fresh blood. On the fifth day after sailing the treatment was changed to the parenteral administration of high doses of procaine penicillin and dihidrostreptomycin sulphate, given twice daily. By means of a stomach tube she was dosed with about 750 ml of vinegar and 2 kg of sugar, in an attempt to stimulate the rumen and avoid ketosis. On the following day she died. A post mortem examination revealed extensive pneumonia and pleuritis, a pale yellow liver and pale kidneys.

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The journey progressed relatively uneventfully until the 14th day, when a second cow died peracutely. She had had similar symptoms to the other animals, but had shown some improvement. On post mortem examination, a cranial subdural haematoma containing about 3 ml of blood and associated with an area of fibrinous meningitis, 5 cm in diameter, was found. There were areas of grey hepatization in the lungs, but these were not extensive. The digestive tract contained a considerable amount of sand, which had originated from the concentrate. The haematoma was regarded as the immediate cause of death.

A day later a cow gave birth to a slightly premature calf. The calf was very small and too weak to stand up to suck from its mother. Colostrum from the mother was administered to it by a short tube. Over the next few days it became stronger, but was never strong enough to stand to to suck. When it was 3 days old, the cow trampled on it and killed it. A second cow aborted a dead foetus that was about 1½ months premature. There was hair on its head and extremities, but not on the body.

We arrived in Cape Town after a voyage of 19 days and transferred the cattle to the quarantine station.

DISCUSSION

Two adult animals and 2 calves were lost on the trip. The other Red Angus cattle showed a severe drop in condition. In my opinion these losses could have been avoided if the following had been done: The cattle should have been brought down from Iowa a few weeks earlier, in order that they could become acclimatized to warmer weather in Houston. During this time they should have been given the feed they were to receive on board ship. The crates should have been constructed with slatted floors. Good quality hay and concentrate, or a complete pelleted cattle feed, should have been supplied. The Brahman bulls, which were from Texas, did not have the stress of the long truck journey before boarding the ship, and were used to warmer weather. None showed the respiratory symptoms suffered by the Red Angus cattle. Heavily pregnant animals should not be exposed to the stress of long distance transport.

ABSTRACT: Basson, P.A., Norval, A.G., Hofmeyer, J.M. Ebedes, H. & Schultz, R.A. 1982. **Antelope and poisonous plants: 1. Gifblaar *Dichapetalum cymosum* (Hooker) Engler & Prantl containing monofluoroacetate.** *Madoqua*, 13, 59-69.

Ten tame eland (*Taurotragus oryx*), four kudu (*Tragelaphus strepsiceros*), two gemsbok (*Oryx gazella*), six springbok (*Antidorcas marsupialis*) and 33 domestic goats were drenched by stomach tube with extracts of the poisonous plant gifblaar (*Dichapetalum cymosum*) (Hooker) Engler and Prantl (=*D. venenatum* Engler and Gilg). Semi-quantitative analyses of the monofluoroacetate (MFA) content of the leaves were conducted at regular intervals and the proven lethal (*ca.* LD_{100}) caprine dose was found to be equivalent to 1,01-1,60 mg/kg MFA. Eland and kudu only succumbed at high dosage levels of 6-8 mg/kg MFA and proved to be much less susceptible to gifblaar poisoning than goats. Springbok and gemsbok were as susceptible as goats, although confirmation is needed in gemsbok to eliminate possible interaction between the immobilising drugs used and MFA. During separate voluntary intake trials, eland ate limited offerings of both low and highly toxic stages of gifblaar. At these dosages they showed no ill effects. Kudu on the other hand were more cautious and intake was minimal.

The lesions caused by gifblaar are described. A few macroscopic lesions observed in some of the animals have not been recorded previously. These include: oedema and haemorrhages of the gall bladder with occasional blood-stained bile; oedema of the abomasum, periportal area of the liver, pancreas and pulmonary valves; adrenal haemorrhages and petechiae in the urinary bladder. Histopathological changes were described in various organs such as the myocardium where replacement fibrosis became evident in animals which survived for two or more days.

Gifblaar poisoning is of considerable economic importance. Although there are apparently no figures available on the annual losses of domestic stock caused by gifblaar in southern Africa, an estimate for the Grootfontein district alone would be at least 300 cattle a year. It is undoubtedly the most important cause of death amongst livestock in this area. Reports of mortalities in wild antelope are also lacking. However, the relatively high resistance of eland and kudu to gifblaar poisoning which became evident during the present studies, tempts one to emphasise the potential of selective game ranching in gifblaar areas and possibly also other areas where poisonous plants abound. It is also interesting to note that gifblaar areas generally fall within the natural habitat of eland and kudu, whereas the major natural habitat of springbok and gemsbok occurs elsewhere. Although small numbers of gemsbok are occasionally found in the gifblaar areas of South West Africa/Namibia, they are known grazers, and were consequently not exposed to MFA during their evolutionary development.

ABSTRACT: Prozesky, L. & Barnard, B.J.H., 1982. **A study of the pathology of lumpy skin disease in cattle.** *Onderstepoort Journal of Veterinary Research*, **49**, 167-175.

Microscopic lesions in cattle infected with the virus of the Neethling form of lumpy skin disease comprised a granulomatous reaction in the dermis and hypodermis which extended to the surrounding tissue. During the early stages of the lesions a vasculitis and lymphangitis with concomitant thrombosis and infarction resulted in necrosis and oedema. A hallmark of the acute to subacute stages of the lesions was the presence of intracytiplasmic eosinophilic inclusions in various cell types. The inclusions consisted of the viroplasm which was identified as aggregates of electron-dense, finely granular to fibrillar deposits in which membrane enclosed virions and occasional groups of tubular structures were observed. Various cytopathogenic changes were observed in cells exhibiting viral proliferation. The morphogenesis of the virions is discussed in relation to the cytopathogenic changes.

THE FIRST ISOLATION OF *LEPTOSPIRA INTERROGANS* SEROVAR *POMONA* FROM CATTLE IN BOTSWANA

S. HERR* and G.M. WINNEN**

ABSTRACT: Herr S.; Winnen G.M. **The first isolation of *Leptospira interrogans* serovar *pomona* from cattle in Botswana.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 83-84 (En) Veterinary Research Institute, 0110 Onderstepoort, Republic of South Africa.

Serological evidence for the occurrence of *L. pomona* associated with abortions in cattle was supported by the successful isolation of the organism from the urine of a cow. Leptospirosis should be considered as a possible cause of abortion even in relatively dry regions.

Key words: *Leptospira,* cattle, abortion.

INTRODUCTION

Leptospiral abortions in cattle have recently been reported for the first time on the western borders of the Transvaal, in the Republic of South Africa[5]. Following serological evidence for the involvement of *Leptospira* in abortions in cattle in the nearby Tuli Block in Botswana, a co-operative effort was instigated in an attempt to isolate the causative organism from the urine of animals involved.

MATERIALS AND METHODS

Animals and locality

The farm involved was a ranching enterprise with Brahman cross cattle situated on the Limpopo river on the Tropic of Capricorn in Botswana. Thirty-six adult cows which had aborted during the previous calving season were selected. A further 4 heifers were also used. Sporadic small abortion storms (4-5 abortions) had occurred on the property for a period of 6 years prior to this investigation.

Urine collection

Seven animals at a time were confined in a crush and given an intravenous injection, in the tail vein, of 500 mg of furosemide (Lasix, Hoechst). Mid-stream urine samples were then collected in sterile plastic beakers.

Media

Leptospira EMJH (Difco Laboratories) semi-solid [0,15 % Bacto agar (Difco Laboratories)] medium containing 0,5 mg 5-fluorouracil (Roche Products) per ml was used. This was dispensed in 5 ml quantities in screw-capped tissue culture tubes. A micropipette with sterile, disposable tips was used to inoculate 0,025 ml urine into 4 tubes from each animal. The media were kept at ambient temperature in the dark for 24 hours and then placed in an incubator at 29°C.

The media were examined twice weekly for 12 weeks for the appearance of a Dinger's zone or for contamination. Contaminated specimens were examined under darkfield microscopy and discarded if no *Leptospira* were seen.

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Media showing a Dinger's zone with pure culture *Leptospira* under darkfield examination were subcultured into fluid EMJH media. When good growth was seen on fluid media between 4-14 days the culture was titrated against standard *Leptospira* anti-sera for the serovars *canicola, grippotyphosa, hardjo, hyos, icterohaemorrhagiae, pomona* and *pyrogenes* (Difco Laboratories).

Direct urine examination

After the inoculation of the media, 150 ml urine was preserved by adding 2,5 ml of a filtered formalin solution. This urine was later centrifuged at 1000 g for 10 min. The supernatant was decanted and re-centrifuged for 60 min at 3000 g. The pellets were examined under darkfield at 160x for the presence of typical *Leptospira* organisms. These examinations were carried out within 72 h of the urine collection.

Serology

Blood was collected from each animal by venipuncture of the tail vein using 10 ml vacuum tubes. The serum was subjected to the microscopic agglutination microvolume technique[7]. The antigens used were 4-14 day cultures of *L. canicola, L. grippotyphosa, L. hardjo (tarrasovi), L. icterohaemoorhagiae, L. pomona* and *L. pyrogenes,* maintained in the dark on liquid modified Stuart's medium at 29°C. The end-point titre was taken as the dilution where 50 % of the organisms, as compared with the negative control, was either absent or visibly agglutinated and where a marked difference existed between it and the immediately preceeding lower dilution. The reciprocal of the titre was used. A titre below 80 was regarded as negative, 80 as suspicious and anything above 80 as positive.

RESULTS

Serology

In 12 animals end-point titres of between 160 and 640 to *L. hardjo* were seen (Table 1). Eight animals were positive to *L. pomona* with titres of 160-2560 (Table 1). The highest titre to *L. pomona* was seen in Specimen no. 10. The 4 heifers included in the trials were serologically negative. Of the 36 cows which had aborted during the previous season only 9 were completely negative serologically. A further 3 had titres of 80 to *L. hardjo* while the rest had titres of 160 to *L. hardjo* and/or *L. pomona.*

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Table 1: DISTRIBUTION OF TITRES TO *LEPTOSPIRA* SEROVARS

No. of animals reacting[1]	Reciprocal of end-point titration for serovars	
	L. hardjo	*L. pomona*
18	Negative	Negative
4	80	
6	160	
4	320	
2	640	
1		80
3		160
3		640
1		1 280
1		2 560

[1]Some animals reacted to both *L. hardjo* and *L. pomona*.

Direct examination of formalinized urine specimens

Although leptospiral-like organisms were seen in 4 specimens under darkfield microscopy, their numbers were few and it was felt that they could not be postitively identified beyond all doubt as *Leptospira*. Except for Specimen no. 10 there was no correlation between high-titred sera and the presence of these organisms/artifacts.

Isolation and typing

A single successful isolate typed as *L. pomona* was made from Specimen no. 10.

DISCUSSION

The serological evidence indicted that *L. pomona* and/or *L. hardjo* could be involved as abortifacients. The fact that some of the cows were negative serologically and some had only low titres may be due to a number of factors. Infected animals do not always develop antibodies after infection. The time elapsed between the occurrence of the abortions and the attempt at isolation may have been sufficient for some animals to return to negative serological reactions[2]. Not all the abortions need necessarily have been due to leptospirosis.

The fact that *L. pomona* was isolated from only one animal is disappointing, but once again a number of factors may have mitigated against more successful isolations. The time interval may be playing a role in that antibodies in the urine may have been present which could affect the viability of the organisms[6]. Similarly the leptospiruric phase only lasts for a few months[4] and may therefore have been intermittent at the time of the investigation. The failure to isolate *L. hardjo* could equally be due to the factors mentioned above or to the fact that *L. hardjo* is a much more fastidious organism than *L. pomona*[1].

The finding that a large percentage of the aborting cattle showed high titres to *L. pomona* and *L. hardjo* coupled with the isolation of *L. pomona* from one of them indicates that *Leptospira* could be considered as the causative organism in this case. As this is the first report of leptopirosis in cattle in Botswana it becomes imperative to consider the disease as a differential diagnosis especially where abortions are occurring and no aetiological diagnosis has been made. The association of leptospirosis with a wet environment may be the main reason for the failure in the past to consider it as a differential diagnosis in this relatively dry region.

ACKNOWLEDGEMENT

A special word of thanks is due to Miss Tertia Dreyer for her technical assistance in the isolation and typing of the organism.

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THE EFFICACY OF FENBENDAZOLE AT A DOSAGE RATE OF 5 mg/kg AGAINST *DICTYOCAULUS VIVIPARUS*

F.S. MALAN*, NANCY A. ROPER* and G. SHABANGU*

ABSTRACT: Malan, F.S.; Roper, N.A.; Shabangu, G. **The efficacy of fenbendazole at a dosage rate of 5 mg/kg against *Dictyocaulus viviparus*. *Journal of the South African Veterinary Association* (1983) 54** No. 2, 85-86 (En) Hoecht Research Station, P.O. Box 124, 1320 Malelane, Republic of South Africa.

Fenbendazole, dosed to artificially infested cattle at 5 mg/kg live mass, was more than 60 % effective in more than 60 % of the treated animals against 1-7 day-old *Dictyocaulus viviparus* larvae reducing the worm load by 87 %. It was more than 80 % effective in more than 80 % of the treated animals against 8-21 day-old worms and 21-34 day-old worms and reduced the worm burdens by 99 % in both cases.

Key words: *Dictyocaulus viviparus,* fenbendazole.

INTRODUCTION

Isolated foci of *Dictyocaulus viviparus* occur in the mist belt of the Drakensberg in Natal and Transvaal as well as in the Western Province. On irrigated pastures, e.g. at the Germiston and Johannesburg sewage disposal farms, the parasites are rife.

Excellent results have been recorded with fenbendazole (FBZ) at 5 mg/kg live mass against immature and adult *Dictyocaulus viviparus*[1,2].

The present paper reports the results of anthelmintic trials in which cattle were artificially infested with *D. viviparus*.

MATERIAL AND METHODS

Animals

Fifty-four, 6 month-old crossbred beef calves, were housed and weaned in concrete-floored cattle pens. They were then fed a calf concentrate twice daily and worm-free hay was available ad libitum.

The animals were treated on 2 occasions with a broad-spectrum anthelmintic for nematodes, cestodes and trematodes and were vaccinated against *Clostriduim chauvoei*, Pasteurellosis, Chlamydiosis and *Clostridium botulinum*.

The calves were divided at random into 3 groups, each of which was dosed orally on several occasions with infective larvae of *D. viviparus* (see Table 1).

Larval Cultures

Faeces of infested calves were placed in flat, square plastic trays (35 cm x 50 cm) to a depth of 1 cm, slightly compressed, kept moist for 5 days, and incubated at room temperature (15-25°C). The tray was covered with a net to prevent flies from having access to the faeces. After 5 days the larvae were washed off the faeces with water, debris was removed by sedimentation and the larvae were stored in the laboratory for a further 7 days before use.

Infective larvae were dosed every day to calves in such a way that on the day of treatment the worms present would either be third (L_3) or fourth (L_4) stage larvae in the first group (i.e. 1-7 days old); in the second group from 8-21 days old (5th stages) and in the last group 21-34 days old (adults).

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Treatment

Treatment with FBZ at 5 mg/kg live mass was administered per os with a syringe. A 10 % suspension of FBZ was used and its concentration was confirmed before it was dosed.

Necropsy

Calves were slaughtered 31-33 d after treatment and autopsies were conducted according to the methods described by Reinecke[5].

Statistical Analysis

Worm recoveries from control and treated calves were subjected to statistical analysis by the method described by Groeneveld & Reinecke[3] and modified by Clark as cited by Reinecke[5].

RESULTS

The results of the larval anthelmintic tests are summarized in Table 1.

1-7 day-old Larvae: (L_3 and L_4)

The median worm burden of the seven control calves was 98 with a variation between 1 and 274. The range of worms present from the treated animals was 0-35.

8-21 day-old worms: (5th stage)

Worms ranged from 1-418 with a median value of 55. Only one animal in the treated group had a single worm.

21-34 day-old worms: (Adult)

The same controls of the 8-21 day group were used. Worm recovery from the treated animals ranged from 0-4.

On statistical analysis a Class B was obtained against 1-7 day-old larvae with a mean reduction of 87 %.

A Class A was obtained against 8-21 and 21-34 day-old worms with a reduction of 99 % in both cases.

DISCUSSION

For registration of an anthelmintic with the Department of Agriculture in order to reach Class A only one of 11 treated animals may exceed the median value of the controls multiplied by 0,25. In the group of animals with L_3 and L_4 at dosing (1-7 day-old worms) 2 animals exceeded this figure and then only by 10 worms, thus just miss-

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Table 1: LARVAL DOSE, RANGE IN NUMBER OF WORMS RECOVERED FROM 7 UNTREATED CONTROL CALVES AND 11 CALVES DOSED WITH FBZ AT 5 mg/kg. PERCENTAGE REDUCTION IN WORM BURDENS AND EFFICACY CLASSIFICATION (NPM)

Dictyocaulus viviparus Larval dose	L_3 and L_4		5th and Adult			
	2625(7x375) Day-7 to-1		3990(14x285) Day-21 to-8		3990(14x285) Day-34 to-21	
	Control	Treated	Control	Treated	Control	Treated
Range of worm burdens	1-274	0-35	1-418	0-1	1-418	0-4
Median	98		55		55	
Group mean	99,6	13,5	115,2	0,1	115,2	1,2
Group mean reduction		87 %		99 %		99 %
Control median X0,25	24,5	2/11>24	13,7	0/11>13	13,7	0/11>13
Control median X0,4	39,2	0/11>39				
Efficacy classification		B		A		A

ing an A claim. The worm burdens in the control animals varied. This may have been due to the reaction of the defence mechanisms of the body to the worms. All the lungs showed extenisve pneumonic lesions although no worms or only a few were recovered.

The method used for cultivating larvae gave excellent yields under our conditions.

It can be concluded that FBZ is highly effective against all stages of *D. viviparus* and can be used in areas where this parasite is rife.

ACKNOWLEDGEMENTS

The authors wish to thank Miss. D. Roper for her assistance with the trial and Prof. R. Reinecke and Mmes H. Viljoen and C. du Plessis for the preparation of the manuscript.

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BOOK REVIEW

BOEKRESENSIE

BACTERIAL AND VIRAL ZOONOSES

REPORT OF A WHO EXPERT COMMITTEE WITH FAO PARTICIPATION
TECHNICAL REPORT SERIES NO. 682

World Health Organisation, Geneva. 1982 pp 146. Price not stated, (ISBN 92 4 120682 9).

This report follows previous publications such as the 1st, 2nd and 3rd (1967) Reports of Joint WHO/FAO Committees on Zoonoses and the 1979 Report on the Parasitic Zoonoses. It is a soft cover A8 publication on good paper and clearly printed.

The Committee found suitable for use the single all-embracing term "zoonosis" because of its world-wide acceptance and common usage. It is clear that the term is used not only to include "those diseases and infections which are naturally transmitted between man and other vertebrates" (Third Report on Zoonoses, 1967) but also those of which the agents live saprophytically and are shared by man and animals, i.e. listeriosis and infantile botulism. This much wider concept of a zoonotic disease or infection explains the inclusion of diseases such as tetanus and botulism in the list in Annex I as well as references to food hygiene and food borne disease.

The Report deals in some detail with the impact of zoonosis and general preventive measures; factors affecting the spread of zoonoses; their diagnosis and surveillance and their prevention and control; the contribution of zoonosis control to other national and international programmes. It closes with main conlusions and recommendations.

More than half the booklet is taken up by some 7 annexures. Annex 1 is a comprehensive table of the essential facts and features of the bacterial and viral zoonoses, e.g. name of disease and causative agent, reservoir, epizootiology, principle animals, personal risk, occurrence, clinical forms in man and animals and diagnosis and control. Annex 2 is a Tree Diagram for Control of Zoonoses and Foodborne Disease. Annex 3 lists the organisations and centres throughout the world which are responsible for international surveillance programmes and information, while Annex 4 lists the names and addresses of the Zoonosis and Collaborating Centres. Annex 5 provides a list of Reviews, Books and Articles on Zoonoses Surveillance and Control. Annex 6 contains a number of useful statements with health information directed at specific groups of persons such as pet owners, food retailers, wildlife workers, etc. Annex 7 summarises the functions of Information and Zoonoses Control Centres.

The booklet, representing as it does the Report of an Expert Committee, provides up to date information for every organisation or person concerned with the zoonotic diseases and their control. As such, it is invaluable.

L.W. v.d. Heever

THE COMPOSITION OF PLASMA AND INTERSTITIAL FLUID OF SHEEP WITH THE 'WET CARCASS' SYNDROME

J. HATTINGH*, G. MITCHELL** and M.F. GANHAO*

ABSTRACT: Hattingh J.; Mitchell G.; Ganhao M.F. **The composition of plasma and interstitial fluid of sheep with the 'wet carcass' syndrome.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 87-89 (En) Department of General Physiology, University of Witwatersrand, 2000 Johannesburg, Republic of South Africa.

Carcasses of sheep from various areas in South Africa and South West Africa (Namibia) show a wet glistening appearance immediately after slaughter. The subcutaneous interstitial fluid of these sheep has a significantly lower protein concentration and colloid osmotic pressure and a significantly higher albumin/globulin ratio than that of normal sheep. These results imply the presence of an oedema and an increased capillary permeability to protein. They suggest that histamine, or an histamine-like substance, mediates the changes.

Key words: A:G ratio, capillary permeability, histamine, hydrostatic pressure, interstitial protein concentration, plasma protein concentraion, wet carcass syndrome.

INTRODUCTION

The 'wet carcass' syndrome of sheep is a condition with a regional geographic distribution in South Africa and South West Africa (Namibia) and, possibly, a seasonal occurrence.

The characteristic sign of the "disease" in sheep is the wet glistening appearance of the carcass immediately after slaughter. Before slaughter the animals are clinically normal. The areas of the carcass affected are the hindquarters, the flanks and the brisket. As the carcass is usually condemned, the disease is of considerable economic importance. It seems likely that the sheep have a subclinical oedema. We have examined this possibility by comparing plasma and interstitial fluid from normal sheep with fluids obtained from sheep showing the 'wet carcass' syndrome.

MATERIALS AND METHODS

Animals

Blood samples and subcutaneous connective tissue were obtained from 12 Dorper sheep showing the syndrome at slaughter at the Chamdor abattoir, Krugersdorp. Blood samples were collected at the time of slaughter and tissue samples immediately after removal of the pelt and prior to washing of the carcass.

For the collection of normal fluid samples, 5 normal Dorper-type sheep were kept under standard husbandry conditions at the Animal and Dairy Science Research Institute, Irene. Blood samples were obtained by venipuncture. Interstitial fluid samples were obtained from polythene capsules inserted subcutaneously in the scapular region under local anaestheisia. Fluid obtained from these capsules by aspiration, 6-8 weeks after implantation, has been shown to be representative of normal interstitial fluid[1,5]. Four to 5 ml of fluid were drawn from the capsules at the same time as blood sampling.

Analytical techniques

Blood plasma was obtained from heparinised (500 IU/ml final concentration) blood samples of all of the animals by centrifugation. Interstitial fluid was obtained from the 'wet carcass' sheep by centrifugation of subcutaneous tissue samples at 5000 G for 20 minutes. Two to 3 ml of fluid were obtained from 4-5 g of the wet tissue.

Sodium and potassium concentrations were analysed using a Radiometer FLM 3 flame photometer, chloride concentrations using a Radiometer CMT10 chloride titrator and osmolalities using a Wescor 5120B vapour pressure osmometer. Albumin/globulin (A:G) ratios were obtained after cellulose acetate electrophoresis using Beckman Microzone equipment and a Digiscreen scanner equipped with an integrator. The total protein content was determined according to Lowry et al.[3] with Folin-phenol reagent using bovine serum albumin as standard. Colloid osmotic pressure measurements were made by means of an electronic colloid osmometer as described by Prather et al.[4] using Amicon PM-10 semipermeable membranes. The instrument was calibrated using bovine serum albumin solutions of known concentrations and a variable mercury column.

RESULTS

The fluid obtained by aspiration from capsules in normal sheep and by centrifugation of tissue of 'wet carcass' sheep was clear, watery and free of cells.

The results of the analysis of the interstitial fluid and plasma sampes are shown in Table 1. In general, samples obtained from both normal and 'wet carcass' animals after slaughter showed higher values for the variables that were measured. This suggests that, prior to slaughter, the animals were mildly dehydrated.

Despite the dehydration, significant differences between normal and affected animals could be shown. The composition of plasma from normal live sheep, normal slaughtered sheep and 'wet carcass' sheep differed significantly only with respect to potassium concentration (Table 1). In both 'wet carcass' sheep and normal slaughtered sheep, potassium levels were significantly higher than in normal living sheep. Potassium concentration in 'wet carcass' sheep and normal slaughtered sheep was not significantly different.

Interstitial fluid of normal sheep and 'wet carcass' sheep differed in several respects. Potassium concentration was significantly higher in the interstitial fluid of 'wet carcass' sheep than in normal sheep. Interstitial fluid of 'wet carcass' sheep also had significantly lower protein concentration and colloid osmotic pressure than that of normal sheep but a significantly higher A:G ratio.

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Table 1: FLUIDS OF NORMAL AND 'WET CARCASS' SYNDROME SHEEP

Fluid	Test		Normal sheep with capsule. N = 20	Normal sheep at slaughter. N = 5	Wet sheep at slaughter. N = 12	P N_L vs N_s	P N_L vs W
PLASMA	CHLORIDE	mmol/ℓ	107 ± 2.8	116 ± 5.0	116 ± 5.9	NS	NS
	SODIUM	mmol/ℓ	139 ± 9.4	137 ± 4.2	138 ± 3.3	NS	NS
	POTASSIUM	mmol/ℓ	4.5 ± 0.5	7.8 ± 1.7	7.7 ± 0.8	<0.01	<0.01
	OSMOLALITY	mosm/kg	293 ± 17.6	302 ± 10.0	304 ± 8.2	NS	NS
	PROTEIN	g/ℓ	78 ± 11.0	85 ± 8.3	83 ± 10.3	NS	NS
	COLLOID OSMOTIC PRESSURE	mmHg	29 ± 9.8	32 ± 6.1	31 ± 5.6	NS	NS
	A:G RATIO		1.2 ± 0.1	1.1 ± 0.2	1.1 ± 0.2	NS	NS
INTERSTITIAL	CHLORIDE	mmol/ℓ	111 ± 2.3		115 ± 11.0		NS
	SODIUM	mmol/ℓ	133 ± 3.3		128 ± 7.0		NS
	POTASSIUM	mmol/ℓ	4.2 ± 0.5		6.4 ± 0.7		<0.01
	OSMOLALITY	mosm/kg	277 ± 11.5		290 ± 27.0		NS
	PROTEIN	g/ℓ	52 ± 11.5		14 ± 3.7		<0.01
	COLLOID OSMOTIC PRESSURE	mmHg	9.8 ± 1.1		3.0 ± 0.6		<0.01
	A:G RATIO		1.5 ± 0.1		2.3 ± 0.6		<0.01

Data are presented as mean ± standard deviation. Significance was tested using Student's 't' test.
N_s = normal slaughter; N_L = normal living; W = 'wet carcass' sheep.

DISCUSSION

It is now well established that the interstitial space is a heterogeneous mixture of gel and free fluid. The free fluid is considered to be in 2 phases: a free fluid phase of relatively small volume and a gel fluid phase containing the major part of the tissue fluid. Normally, the gel phase is saturated and alteration in the water content of the interstitial space is determined by changes in free fluid content[2].

Oedema is characterised by an increase in the free fluid volume of the interstitial space. Classically, an increase in free fluid will occur if mean capillary pressure increases, plasma protein concentration decreases, resistance to lymph flow increases and/or if there is a change in capillary permeability, as predicted by Starling's equation: $Pc - Pif = \Pi c - \Pi if$ where Pc = capillary hydrostatic pressure, Pif = interstitial hydrostatic pressure, Πc = capillary colloid osmotic pressure and Πif = interstitial osmotic pressure.

An increase in capillary hydrostatic pressure most commonly results from a raised venous hydrostatic pressure. Since, in our animals, there was no suggestion of right-sided heart failure, a raised venous hydrostatic pressure is unlikely to be the cause of the increase in free fluid in 'wet carcass' syndrome. Similarly there was no evidence of lymph obstruction and thus it is unlikely that fluid accumulated because of decreased drainage. Moreover, it is extremely unlikely that the high morbidity of this syndrome is a result of a disease affecting either the myocardium or lymph vessels.

However, in 'wet carcass' sheep there is evidence that capillary hydrostatic pressure is raised. This evidence is that both the colloid osmotic pressure and total protein content of interstitial fluid of 'wet carcass' sheep is low, whereas the plasma protein content and colloid osmotic pressures are the same as those of normal sheep.

One explanation for these data is that filtration of low protein fluid into the interstitial space has increased. Since venous hydrostatic pressure is unlikely to be increased, capillary hydrostatic pressure must have increased because of arteriole dilatation. The A:G ratio of 'wet carcass' sheep is high. This finding suggests that in such sheep, the capillary permeability to albumin has increased. The 3 features of the 'wet carcass' syndrome in sheep are, therefore, a normal plasma protein concentration, a low interstitial protein concentration and a raised A:G ratio. These changes can best be explained by the effect of histamine or a histamine-like substance on the affected tissue. Such a substance would dilate arterioles, thus raising capillary hydrostatic pressure and increasing filtration of fluid. It would also increase capillary permeability to protein selectively (more albumin than globulin). The net effect of these changes is that fluid filtration is greater than the rate of protein filtration and a low protein fluid with an increased A:G ratio accumulates in the tissue.

Finally, our results have shown that 'wet carcass' sheep have high plasma and interstitial potassium concentrations. Since normal sheep show high plasma potassium concentration after slaughter, it seems likely that the slaughter technique was responsible for the raised plasma and intersitital potassium concentration found in them.

In summary our data suggest that the 'wet carcass' syndrome of sheep results from a selective increase in

permeability of capillary blood vessels combined with a raised mean capillary hydrostatic pressure. Histamine, or histamine-like substances, will cause both of these changes. It would thus seem that a mild allergic process is involved and that anti-histamine therapy could be beneficial.

ACKNOWLEDGEMENT

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BOOK REVIEW

BOEKRESENSIE

ANIMAL DISEASE OCCURRENCE

VOLUME 3: 1982

Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3 BN, United Kingdom. Annual subscription £73,00 (US $158,00) (ISSN 0144 3879). Published yearly in 2 numbers (in June and December)

The objectives of *Animal Disease Occurrence* are to provide recent information on animal diseases of economic or public health importance and to present it in a form which will be useful to the users. The animal species included are domestic and wild mammals, poultry, bees and fish, and non-notifiable as well as notifiable diseases are covered.

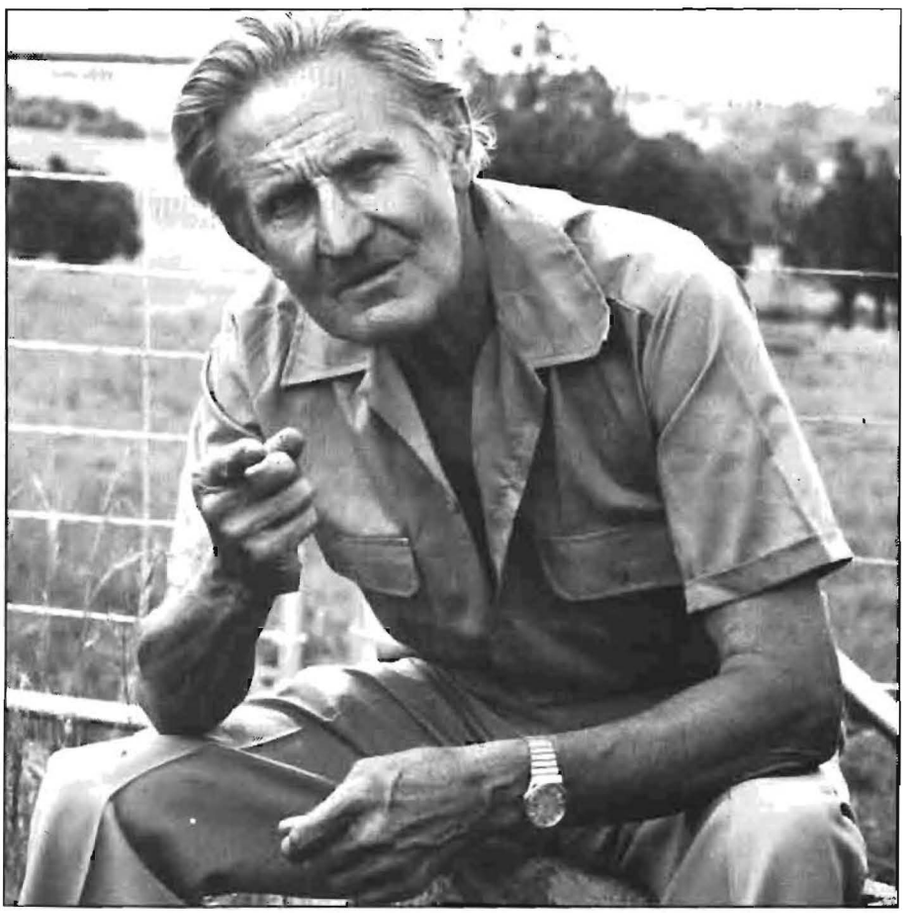
The journal is divided into 2 main sections. The first consists of abstracts of relevant articles in English which are classified into the 12 headings of: Animal diseases in general, Diseases of horses, cattle, sheep and goats, swine, dogs and cats, poultry, fishes and bees, Diseases of other animals, and a List of pathogens and parasites. In the second section there are 12 tables of factual data which have been derived from information obtained from the abstracts. The table contents are cross-referenced by a numbering system with the first section. These tables correspond, with one exception, to the 12 headings in the first section. The exception is devoted to the geographical occurrence of the disease noted in the first section. Author and subject indices are also provided.

The system used provides an easy and rapid manner of monitoring the vast amount of relevant literature which seems to expand annually at an ever-increasing rate. It is not, however, the intention of the journal to provide immediate notification of diseases or disease outbreaks. The tables include the diseases with the time and country of occurrence, type of animal concerned and significant aspects.

Animal Disease Occurrence is yet another contribution of the Commonwealth Agricultural Bureaux, which also publishes the well-known Veterinary Bulletin, whose objective is to assist those concerned with animal health to keep abreast of the vast amount of information published annually. As such, the presentation of the information supplied in this journal may not necessarily be done in a manner to suit all veterinarians in private practice but it is certainly of significance for all those concerned with the control, prevention and epizootiology of animal diseases. The journal should be available to all veterinarians in the latter category.

R.C. Tustin

"I'm self-employed. I started building my pension late in life and I need to build it as fast as I can..



"In the early years I ploughed everything I earned into the business. Now I'm able to begin thinking more about myself. I however, I know I will continue to have bad years among the very good.

So I'm committed to invest an annual amount that I believe will not overstretch my cash flow at any time.

Then every time I have a good year, I can boost my pension program with lump sum payments over my normal annual premiums.

This way I keep my pension growing as my good fortune dictates. And the taxman ends up paying a sizeable portion of my investment."

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By giving Old Mutual just one month's notice, you can start retiring. So if you decide to work only part of the month and draw less salary you can call on a portion of your FlexiPension to maintain your income level while the balance continues to grow. And can even be built on and boosted as your financial status allows.

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Tax relief for the self-employed

New Government legislation allows you to make lump sum contri-

„I need flexibility."

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Take the case of a businessman, a farmer or professional man who at 40 commits himself to 30 units of R100 each to finance his FlexiPension Program (contributing R3 000 p.a.).
A month before his 60th birthday he informs Old Mutual of his decision to gradually phase himself out of his business into retirement, taking a drop in income from his business each time he "cashes" a portion of his FlexiPension units.
On the assumption that the average net annual compound growth rate in Old Mutual's FlexiPension investment portfolio will be 12% p.a. and that its current annuity rates (1.2.82) and methods of calculation will still apply, his projected position will be as follows.

	Amount available to buy a pension R	One-third taken in cash to reinvest R	Balance as monthly pension R	Cumulative monthly pension R
6 units at 60	43 770	14 590	347,12	347,12
6 units at 62	56 190	18 730	455,46	802,58
8 units at 64	95 776	31 925	790,82	1 593,40
6 units at 66	91 446	30 482	768,78	2 362,18
4 units at 69	87 036	29 012	751,66	3 113,84
Total at age 69	374 218	124 739	3 113,84	

Please note that if the average annual compound growth rates are higher than the 12% assumed above, improved benefit payments will arise but, conversely, if the actual rates are lower the proceeds will be lower than those stated above.

butions from time to time, in addition to your regular premium units.

The tax concessions allowed are highly favourable. In any one income tax year your contributions to FlexiPension and other retirement annuities you might have, are tax deductible up to 15% of your net income from your business or profession.

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This is where FlexiPension relies on Old Mutual's financial strength and profit-earning power. It has no shareholders, so all the profits are shared among its policyholders. In this way Old Mutual adds profit to your investment to increase its worth.

Through a phone call to your insurance broker or any Old Mutual office you can have a personal pension program with flexibility to build it as your good fortune dictates.

THE EFFICACY OF FENBENDAZOLE AT A DOSAGE RATE OF 5 mg/kg AGAINST THE THIRD AND FOURTH STAGE LARVAE OF *DICTYOCAULUS FILARIA* IN SHEEP

F.S. MALAN* and NANCY A. ROPER*

ABSTRACT: Malan, F.S.; Roper, N.A.; **The efficacy of fenbendazole at a dosage rate of 5 mg/kg against the third and fourth stage larvae of *Dictyocaulus filaria* in sheep.** *Journal of the South African Veterinary Association* (1983) 54 No. 2, 92 (En) Hoechst Research Station, P.O. Box 124, 1320 Malelane, Republic of South Africa.

Fenbendazole, dosed to experimentally infested sheep at 5 mg/kg live mass, against immature *Dictyocaulus filaria*, was more than 80 % effective in more than 80 % of the animals.

Key words: *Dictyocaulus filaria*, fenbendazole.

INTRODUCTION

Fenbendazole: methyl 5-(phenyl-thio)-2-benzimidazole-carbamate (Loewe & Urbanietz[1]) is registered in the Republic of South Africa as an anthelmintic for sheep at a dosage rate of 5 mg/kg live mass, and is more than 80 % effective in more than 80 % of the animals treated (Class A) against third stage larvae (L_3), fourth stage larvae (L_4) and adults of *Haemonchus contortus, Trichostrongylus colubriformis, Ostertogia circumcincta, Nematodirus spathiger, Strongyloides papillosus, Oesophagostomum columbianum, Chabertia ovina* and *Gaigeria pachyscelis*.

Class A efficacy was also obtained against adult stages of *Dictyocaulus filaria* but this fell to Class B (more than 60 % effective in more than 60 % of the animals treated) against L_3 and L_4 of this nematode.

Fenbendazole (FBZ) at a dosage rate of 5 mg/kg against fifth stage *D. filaria* is 100 % effective[3,4].

This paper reports on anthelmintic trials with FBZ against L_3 and L_4 of *D. filaria*.

MATERIALS AND METHODS

Sheep

Twenty-one, five month old Merino lambs were housed in worm-free conditions in a sheep shed with wooden lattice floors and fed a sheep concentrate twice daily and worm-free hay and fresh water ad libitum.

The sheep were treated on 2 occasions with a broad-spectrum anthelmintic for nematodes, cestodes and trematodes prior to being introduced into the trial.

Larval dosage, Treatment and Slaughter

Each animal was orally dosed with 125 infective larvae of *D. filaria* every day for 8 days.

On Day 0 a larval viability control sheep was slaughtered to confirm the presence of L_3 and L_4. The mass of a further 11 sheep selected at random was determined and each dosed with TBZ at 5 mg/kg live mass.

Twenty-eight and 29 days later 9 controls and 11 treated sheep were killed and autopsies were conducted according to the methods described by Reinecke[2].

Statistical analysis

Data were subjected to statistical analysis by the non parametric method (NPM)[2].

RESULTS

Day 0 Control

One-hundred-and-ten L_3 and L_4 were recovered from the mesenteric lymph-nodes on the day of treatment.

Controls

Fifty-eight to 322 *D. filaria* were present in the bronchi with a median count of 137.

Treated Sheep

No worms were present in any of the 11 treated animals.

DISCUSSION

The efficacy of FBZ at 5 mg/kg agains L_3 and L_4 of *D. filaria* was excellent, confirming the 100 % efficacy against 5th stage and adult worms of this species obtained by Tiefenbach[4].

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TWEE GEVALLE WAAR *OSTERTAGIA* spp. VAN SKAPE TEEN BENSIMIDASOOL WURMMIDDELS BESTAND IS

P.C. VAN SCHALKWYK*, T.L. GEYSER* EN V.S. REZIN*

ABSTRACT: Van Schalkwyk P.C.; Geyser T.L.; Rezin V.S. **Two field isolates of *Ostertagia* spp. of sheep showing resistance to benzimidazole anthelmintics.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 93-98 (Afrik) SmithKline Animal Health, Terenure Research Station, P.O. Box 38, 1600 Isando, Republic of South Africa.

Two field isolates of *Ostertagia* spp. of sheep from the Swellendam and Malmesbury districts in the south-western Cape were shown to be resistant to benzimidazole anthelmintics. At therapeutic dosage rates albendazole was 32,5 %, thiabendazole 0 %, oxfendazole 14,9 % and morantel 91,4 % effective against the adult stage of *Ostertagia* spp. in naturally infested lambs at Swellendam. Efficacy against the adult stage of the same isolate of *Ostertagia* spp. in artificially infested sheep in the laboratory was tested at dosage rates of albendazole 3,8 mg/kg or 7,6 mg/kg, mebendazole 15 mg/kg, levamisole 7,5 mg/kg and morantel 14,5 mg/kg and varied from 0 %, 0 %, 1,9 % 53,9 % and 87,0 % respectively. Albendazole, the only anthelmintic tested against the Malmesbury strain of *Ostertagia* spp. was 9,8 % effective against the adult stage in naturally infested lambs. *Trichostrongylus* spp. and *Nematodirus* spp. simultaneoulsy present in these animals were fully susceptible to all the anthelmintics tested.

Key words: Anthelmintic resistance, benzimidazoles, *Ostertagia* spp., sheep.

INLEIDING

In Australië is weerstandbiedendheid van nematode teen wurmmiddels van verskeie chemiese groepe 'n bekende verskynsel. Donald[4] en Prichard et al.[18] het onlangs oorsigte oor die weerstand by *Haemonchus* spp. *Ostertagia* spp. en *Trichostrongylus* spp. gelewer en Kelly & Hall[11] beskou weerstand van nematode teen middels as 'n ernstige bedreiging vir diereproduksie oor die langtermyn.

In die Republiek van Suid-Afrika (RSA), daarenteen was slegs *Haemonchus contortus* dusver betrokke. Berger[2] en van Wyk[22] het stamme met weerstand teen bensimidasole en van Wyk[22] ook 'n ligte weerstand teen rafoksanied beskryf.

Onlangs het ons in 2 afsonderlike veld gevalle *Ostertagia* spp. met 'n hoë graad van weerstand teen bensimidasool middels geïsoleer en 3 proewe daarmee uitgevoer. Hierdie is die eerste verslag van weerstand by *Ostertagia* spp. in die RSA.

EKSPERIMENT 1: VELDBESMETTING (SWELLENDAM)

'n Voorlopige ondersoek, insluitend miseiertellings en wurmtellings van 'n paar skape van 'n plaas in die distrik Swellendam, het gedui op weerstand van die *Ostertagia* spp. teen bensimidasool wurmmiddels. Gevolglik is meer volledige proewe beplan om die omvang van die weerstandbiedendheid te bepaal.

PROEFPROSEDURES

Vyf-en-twintig suiplammers uit die kudde is na Terenure naby Kempton Park, Transvaal vervoer, waar hulle onder toestande gehuisves is wat blootstelling aan verdere wurmbesmetting uitgeskakel het. Terwyl die lammers nog op die weiding was, het die eienaar hulle met ongeveer maandelikse tussenposes met óf albendasool ('Valbazen', SmithKline) óf oksfendasool ('Systamex', Coopers) behandel maar geen doserings is gedurende die laaste drie weke voordat die lammers van die weidings verwyder is toegedien nie. By aankoms op Terenure is die lammers met behulp van tabelle van ewekansige syfers in 5 groepe verdeel, waarna die groepe op dieselfde wyse aan 5 behandelings toegeken is, naamlik albendasool (ABZ) teen 3,8 mg/kg, oksfendasool (OFZ) teen 5,03 mg/kg, tiabendasool (TBZ) ('Thibenzole'; MSD) teen 44 mg/kg en morantel (MOR) ('Banminth II', Pfizer) teen 14,5 mg/kg en 'n onbehandelde kontrole groep.

Die kontroles is op die dag van behandeling (Dag 0) van die ander groepe vir wurmherwinning geslag. Miseiertellings is op Dag 0 en weer 4 dae later, toe die behandelde groepe geslag is, uitgevoer.

By nadoodse ondersoek is die pH van die abomasumvloeistof eers met 'n elektroniese pH-meter bepaal en daarna is die maaginhoud as volg vir wurmherwinning verwerk: Die inhoud van die abomasum en dunderm is afsonderlik deur 'n 37 mμ sif gewas en die slymvliese van beide organe is na vertering in aangesuurde pepsien soos deur Reinecke[19] beskryf, sootgelyks gesif. Een 1/20ste alikwot van elke abomasum-ingesta en slymvlies monster, en een 1/10de alikwot van elke dundermingesta is mikroskopies vir wurms ondersoek. Die verteerde dundermslymvlies is geheel mikroskopies ondersoek.

RESULTATE

Die resultate is in Tabelle 1, 2 en 3 opgesom. Die *Ostertagia* spp. het bestaan uit *O. circumcincta* (91 %) en *O. trifurcata* (9 %) en die *Trichostrongylus* spp. uit 50 % *T. colubriformis* en 50 % *T. rugatus*.

Die gemiddelde persentasie vermindering by volwasse *Ostertagia* spp. was 32,5 % na behandeling met ABZ, 14,9 % na OFZ, 0 % na TBZ en 91,4 % na MOR. In die geval van *Trichostrongylus* spp. en *Nematodirus* spp. het die doeltreffendheid van die middels gewissel van 96,3-99,9 % en van 83,7-99,8 % teen die onderskeie genera. Die gemiddelde pH van die abomasum van die kontroles op Dag 0 was 5,1 teenoor waardes van 3,5, 4,6, 5,3 en 3,3 onderskeidelik in die ABZ, OFZ, TBZ en MOR groepe op Dag +4. Miseiertellings is in dieselfde onderskeie groepe verminder met 75,5 %, 90,6 %, 78,7 % en 97,3 % onderskeidelik.

BESPREKING

Die nadoodse wurmtellings dui aan dat hierdie isolaat

*SmithKline Dieregesondheid, Posbus 38, 1600 Isando.

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Tabel 1: EKSPERIMENT 1: WURMEIERTELLINGS (epg) IN SKAAPMIS VOOR EN NA BEHANDELING MET VERSKILLENDE WURMMIDDELS IN NATUURLIKE BESMETTINGS – (SWELLENDAM)

GROEP	DIER NR.	VOOR BEHANDELING (DAG 0)	NA BEHANDELING (DAG +4)	VERMINDERING
Onbehandelde Kontroles	54	16900	– *	
	57	4900	– *	
	59	2300	– *	
	60	9600	– *	
	70	8400	– *	
	72	33500	– *	
ABZ 3,8 mg/kg	52	8200	2500	
	63	3700	3000	
	71	8100	400	
	74	7200	4100	
	75	14800	300	
		Gemiddeld 8400	Gemiddeld 2060	75,5 %
OFZ 5,03 mg/kg	51	18300	400	
	56	14800	1400	
	58	10100	2700	
	56	3800	100	
	69	10300	800	
		Gemiddeld 11460	Gemiddeld 1080	90,6 %
TBZ 44,0 mg/kg	53	30500	4900	
	61	(3300)	**	
	65	3100	1100	
	73	8100	2900	
		Gemiddeld 13900	Gemiddeld 2967	78,7 %
MOR 14,5 mg/kg	55	7100	200	
	62	33700	1000	
	64	6200	0	
	67	14400	500	
	68	1900	0	
		Gemiddeld 12660	Gemiddeld 340	97,3 %

* Die kontroles is op Dag 0 geslag
** Dier is dood voor slagdag – geen monster geneem nie
( ) Nie ingesluit by die gemiddeld nie

van *Ostertagia* spp. baie bestand is teen terapeutiese dossisse van die 3 bensimidasole wat getoets is, maar wanneer eiertellings voor en na behandeling vergelyk word, is 'n skynbaar hoë doeltreffendheid verkry. Daar moet egter in gedagte gehou word dat die vermindering van *Trichostrongylus* spp. in hierdie proef gedeeltelik verantwoordelik was vir hierdie waarneming en dat weens die vervoer van die diere oor 'n lang afstand en die aanpassing in klein hokkies, die eiertellings moontlik verwag kon word om te variëer.

Kelly & Hall[11] noem egter ook dat daar nie alleen op eiertellings staatgemaak kan word as aanduiding van weerstand by 'n gemengde besmetting nie, aangesien hulle 'n vermindering van meer as 90 % gevind het sonder 'n soortgelyke vermindering in die wurmlading.

Farmakokinetiese faktore moes ook oorweeg word as moontlike redes vir die swak doeltreffendheid van die wurmmiddels in hierdie eksperiment. Die proeflammers was nog ongespeen en was gevolglik nie werklike herkouers nie maar eerder *fisiologiese monogastries*. Verskeie navorsers het die belangrikheid van die rumen in die farmakokinetika van wurmmiddels beskryf[3 14 15 16]. Faktore soos rumen en abomasum pH en tempo van rumen en gastriese leegmaking kan 'n groot invloed op die absorpsie en biotransformasie van middels uitoefen. In hierdie eksperiment is gevind dat die pH van die abomasums van die onbehandelde kontroles abnormaal hoog was en hierdie feit tesame met die afwesigheid van 'n rumen reservoir kan as moontlike oorsake van die swak doeltreffendheid oorweeg word. Ons het derhalwe besluit om hierdie *Ostertagia* in ouer skape te toets.

EKSPERIMENT 2: KUNSMAGTIGE BESMETTING (SWELLENDAM ISOLAAT)

Ten einde die resultaat van Eksperiment 1 te bevestig, het ons hierdie verdere proef uitgevoer deur gebruik te maak van kunsmatige besmettings, wat voor behandeling vanuit die skape van Eksperiment 1 geïsolleer is.

PROEFPROSEDURES

Die *Ostertagia* spp. wat in die natuurlike besmette lammers van Eksperiment 1 voorgekom het, is geïsoleer deur middel van miskulture wat voorberei is voordat die lammers behandel is. Hierdie isolaat is gebruik om 30 wurmvrye skape van ouer as 'n jaar te besmet. Die larwes wat uit die kulture verkry is, het uit 35 % *Ostertagia* spp. en 65 % *Trichostrongylus* spp. bestaan. Elke skaap is daagliks vir 3 agtereenvolgende dae met 2 000 besmetlike larwes (L_3) besmet. Twintig dae na die laaste besmetting is die lammers aan hand van tabelle van ewekansige syfers in 6 groepe verdeel en met albendasool, levamisool (LEV), mebendasool (MBZ) of morantel behandel soos in Tabel 2 aangedui. Drie onbehandelde kontroles is op die dag van behandeling (Dag 0), en die res van die kontroles en behandeldes, 15 dae later geslag.

Wurms is met behulp van die waterbad metode, soos

Tabel 2: EKSPERIMENT 1: BEPALINGS VAN DIE INGESTA VAN DIE RUMEN EN ABOMASUM pH**

GROEP	DIER NR.	RUMEN	ABOMASUM
Onbehandelde kontroles	54	7,0	6,2
	57	6,9	3,8
	59	6,2	6,7
	60	6,9	5,4
	70	6,9	5,4
	72	6,6	3,2
			Gemiddeld 5,1 (sa ± 1,36)
ABZ 3,8 mg/kg	52	7,8	3,9
	63	– *	3,8
	71	7,3	2,7
	74	7,5	3,0
	75	7,3	4,0
			Gemiddeld 3,5 (sa ± 0,59)
OFZ 5,03 mg/kg	51	7,8	7,3
	56	7,5	3,5
	58	7,2	5,8
	66	– *	3,4
	69	7,9	2,9
			Gemiddeld 4,6 (sa ± 1,89)
TBZ 44,0 mg/kg	53	– *	4,8
	61	– *	7,4
	65	– *	4,3
	73	7,3	4,5
			Gemiddeld 5,3 (sa ± 1,44)
Mor 14,5 mg/kg	55	– *	3,8
	62	– *	3,3
	64	7,5	2,6
	67	– *	3,3
	68	7,6	3,5
			Gemiddeld 3,3 (sa ± 0,44)

** Bepaal op Dag 0 by onbehandelde kontroles en Dag + 4 by behandelde groepe
* Geen monsters geneem nie

beskryf deur Reinecke[19], herwin en die monsters is as volg ondersoek: Totale mikroskopiese tellings van maaginhoud filtrate en verteerde slymvliese en een 1/10de alikwotte van die maaginhoud reste.

RESULTATE

Die resultate is in Tabel 4 opgesom. Die gemiddelde persentasie vermindering van volwasse *Ostertagia* spp. was 0 %, 1,9 %, 53,9 % en 87,0 % onderskeidelik vir BZ, MBZ, LEV en MOR. Meer as 99 % van die wurms wat uit die 3 Dag 0 kontroles herwin is, was in die volwasse stadium. Die dunderms is nie vir herwinning van *Trichostrongylus* spp. ondersoek nie aangesien die vorige eksperiment getoon het dat die betrokke middels teen hierdie wurm doeltreffend is.

BESPREKING

Die 6 000 L_3 wat per skaap toegedien is, het hoofsaaklik uit *Trichostrongylus* spp. bestaan en gevolglik is slegs lae getalle *Ostertagia* spp. herwin.

'n Hoë graad van weerstand teen bensimidasole is weereens opgemerk. Ten spyte daarvan dat die *Ostertagia* spp. nie intussen aan bensimidasole blootgestel is nie en daar derhalwe 'n soortgelyke resultaat as in Eksperiment 1 verwag is, was die doeltreffendheid in hierdie proef selfs laer as voorheen. Moontlik kan die kleiner getal wurms in hierdie proef en die redelike groot variasie in tellings van die vorige proef, waar van 'n veldbesmetting gebruik gemaak is, vir die verskil verantwoordelik wees. Die resultate van hierdie 2 eksperimente dui aan dat die *Ostertagia* spp. slegs teen bensimidasole weerstandbiedend is. Hoewel morantel slegs 60,9 % doeltreffend teen die 4de stadium larwes (L_4) was, is dit in ooreenstemming met die Klas C etiketaanspraak (meer as 50 % doeltreffend in meer as 50 % van behandelde diere)[21] van die middel, gegrond op toetsing volgens die nie-parametriese metode soos beskryf deur Groenewald en Reinecke[6]. Die swak doeltreffendheid (53,9 %) van levamisool teen die volwasse wurms kan bes moontlik ook nie as weerstand beskou word nie aangesien die etiketaanspraak in die RSA, Klas B (meer as 60 % doeltreffend in meer as 60 % van behandelde diere) is[21]. Slegs 5 skape is met levamisool behandel en relatiewe hoë tellings by 2 van die 5 het die doeltreffendheid na minder as 60 % verminder.

Alvorens besliste gevolgtrekkings egter gemaak kan word hieroor, behoort meer volledige proewe met laasgenoemde 2 middels uitgevoer te word.

EKSPERIMENT 3: VELDBESMETTING (MALMESBURY)

Tydens 'n wurmopname op 'n plaas in die Malmesbury distrik is gevind dat lammers steeds positiewe miseiertellings gehad het nadat hulle met verskeie bensimidasole behandel is. Daar is toe besluit om 'n gekontroleerde proef met natuurlike besmette lammers uit te voer.

PROEFPROSEDURES

Tien natuurlik besmette lammers is op grond van eiertellings uitgesoek en na Terenure vervoer, waar hulle gehuisves is soos beskryf in Eksperiment 1. Ses dae na aankoms is hulle volgens eiertellings in 2 groepe verdeel. 'n Groep van 5 is as onbehandelde kontroles gelaat en die ander groep is met albendasool teen 'n dosis van 3,8 mg/kg lewende massa behandel. Sewe dae na behandeling is alle skape geslag en vir wurms ondersoek soos beskryf in Eksperiment 1.

RESULTATE

Die resultate is in Tabel 5 opgesom. Die gemiddelde persentasie vermindering van volwasse *Ostertagia* spp. was 9,8 % en dié van *Nematodirus* spp. en *Trichostrongylus* spp. was 100 % en 99,4 % onderskeidelik.

BESPREKING

Soos in die geval van die Swellendam *Ostertagia* spp. was hierdie *Ostertagia* spp. ook weerstandbiedend teen albendasool maar die klein getal *Nematodirus* spp. en *Trichostrongylus* spp. was baie vatbaar vir die middel.

Alhoewel nie getoets nie, is dit in die lig van die bekende kruisweerstand tussen bensimidasole en die resultate met die Swellendam *Ostertagia* spp. te betwyfel of ander bensimidasole teen die Malmesbury isolaat doeltreffend sal wees. Dit is egter raadsaam dat ander bensimidasole en ook ander nie-bensimidasool wurmmiddels teen die Malmesbury *Ostertagia* spp. getoets word.

ALGEMENE BESPREKING

'n Wurmpopulasie raak bestand teen 'n middel wanneer

Tabel 3: EKSPERIMENT 1: GETAL PARASIETE HERWIN BY NADOODSE ONDERSOEK VAN SKAPE MET 'N NATUURLIKE VELDBESMETTING IN SWELLENDAM

GROEP	DIER NR.	*Ostertagia* spp. L_4	*Ostertagia* spp. VOLWASSE	*Trichostrongylus* spp. VOLWASSE	*Nematodirus* spp. ALLE STADIUMS	ONIDENTIFISEERDE ONVOLWASSENES IN DUNDERM
Onbehandelde Kontroles	54	42960	11940	7708	535	3647
	57	26900	8040	7238	1447	2756
	59	40976	9595	11362	372	7605
	60	48780	4460	9192	1485	762
	70	58520	6860	9914	232	2474
	72	75480	20620	21799	1254	4656
	Gemiddeld	48936,0	10525,5	11202,2	887,5	3650,0
Albendasool 3,8 mg/kg	52	70740	9480	40	200	0
	63	36420	6900	20	20	0
	71	34550	6930	0	90	0
	74	13290	10120	10	0	0
	75	27660	1170	0	60	0
	Gemiddeld	36532,0	6920,0	14,0	74,0	0
	% Vermindering	25,3	32,5	99,9	91,7	100
Oksfendasool 5,03 mg/kg	51	28710	11970	0	40	0
	56	45040	9110	0	130	0
	58	22400	13910	20	20	20
	66	36160	1450	10	0	0
	69	45150	7200	10	30	0
	Gemiddeld	35492,0	8728,0	8,0	44,0	4,0
	% Vermindering	27,5	14,9	99,9	95,0	99,9
Tiabendasool 44 mg/kg	53	73600	16380	10	60	0
	61	19120	10020	0	430	0
	65	44750	9740	0	40	0
	73	28210	8690	10	50	0
	Gemiddeld	41420,0	11207,5	5,0	145,0	0
	% Vermindering	15,4	0	99,9	83,7	100
Morantel 14,5 mg/kg	55	36020	1420	510	0	20
	62	20380	960	570	0	0
	64	9390	1080	340	0	0
	67	15520	660	570	10	0
	68	14410	300	90	0	10
	Gemiddeld	19144,0	884,0	416,0	2,0	6,0
	% Vermindering	60,9	91,4	96,3	99,8	99,8

Tabel 4: EKSPERIMENT 2: GETAL NEMATODE HERWIN IN PROEWE MET VERSKILLENDE WURMMIDDELS MET VOLWASSE *OSTERTAGIA* spp. NA KUNSMATIGE BESMETTING – SWELLENDAM ISOLAAT

	ONBEHANDELDE KONTROLES	ABZ 3,8 mg/kg	ABZ 7,6 mg/kg	MBZ 15,0 mg/kg	LEV 7,5 mg/kg	MOR 14,5 mg/kg
	177	171	143	120	17	14
	197	208	153	186	21	27
	216	217	234	227	31	32
	238	241	313	240	133	42
	250	305	364	313	308	–
	250	–	–	–	–	–
TOTAAL	1328	1142	1207	1086	510	115
GEMIDDELD	221,3	228,4	241,4	217,2	102,0	28,8
% VERMINDERING	–	0	0	1,9	53,9	87,0

Tabel 5: EKSPERIMENT 3: GETAL WURMS HERWIN IN PROEWE MET 'N VELDBESMETTING BY MALMESBURY

	Ostertagia spp.		*Nematodirus* spp.	*Trichostrongylus* spp.
GROEP	L_4	VOLWASSE	ALLE STADIA	ALLE STADIA
Onbehandelde Kontroles	5080	2929	20	114
	10380	5159	60	130
	4062	7977	0	310
	11020	7157	0	200
	3322	5422	260	965
Gemiddeld	6772,8	5728,8	68,0	343,8
ABZ 3,8 mg/kg	2500	6654	0	10
	10900	1756	0	0
	2680	5175	0	0
	3140	8066	0	0
	1700	4178	0	0
Gemiddeld	4184,0	5165,8	0	2,0
% Vermindering	38,2	9,8	100	99,4

'n aanhoudende seleksie van opeenvolgende geslagte 'n progressiewe verhoging in die frekwensie van bestande gene teweegbring[18]. Die belangrikste eienskap van weerstand is die feit dat dit geneties tot uiting kom en oorerflik is[11].

Nadat Le Jambre et al.[12] in Australië bewys het dat *Ostertagia circumcincta* in die laboratorium deur seleksie teen tiabendasool, levamisool en morantel bestand gemaak kon word, is veldstamme van die wurmsoort gevind wat deur natuurlike seleksie teen dieselfde middels bestand geraak het[8 13 20]. Soortgelyk is veldstamme van beide *Haemonchus contortus* en *Trichostrongylus colubriformis* gevind, met veelvuldige weerstand teen bensimidasole, levamisool en morantel[5 23].

Gedurende die afgelope 6 jaar is lammers op die plaas naby Swellendam gereeld voor speen ouderdom 2-4 maal met kambendasool behandel. Daarna is hulle tot op die ouderdom van 18 maande met maandelikse tussenposes met verskillende bensimidasole behandel. Slegs by uitsondering is die kudde een of tweemaal per jaar met morantel of tetramisool behandel. Volledige besonderhede kon nie verkry word van die doserings op die plaas naby Malmesbury nie, maar die kudde het ook 'n geskiedenis van intensiewe behandelings met hoofsaaklik bensimidasole.

Bestuur en klimaat kon 'n groot rol in die ontstaan van weerstand op die plaas naby Swellendam gespeel het. 'n Stelsel van 3 lamseisoene per jaar het tot gevolg dat daar gedurig jong vatbare lammers op die weiding is, die wurms waarvan aan intensiewe seleksie met bensimidasole blootgestel is. Die weidings bestaan uit droëland lusern en klawer wat slegs deur skape bewei word. Verder is die reënval nie-seisoenaal tot dié mate dat, volgens akkurate reënvalrekords van 'n naburige plaas meer as 10 mm reën in 63 uit 72 maande gedurende 'n 5 jaar periode geval het, met slegs 2 maande sonder reën. Hoewel die jaarlikse reënval laag is en gewissel het van 372 tot 575 mm op dié naburige plaas, is daar waarskynlik deur die hele jaar voldoende vogtigheid vir aansienlike oorlewing van wurmlarwes.

Ostertagia spp. van skape kom in die RSA in die warm vogtige winter en nie-seisoenale reënvalgebiede langs die kusstreke van die Grens, Oos-Kaap en Westelike Provinsie asook in die droë somerreënvalgebiede van die Klein en Bo-Karoo[9] voor. Hoewel dit nie in die RSA ekonomies so belangrik soos *Haemonchus contortus* is nie, is dit een van die belangrikste genera in dié areas waar dit voorkom[1 17]. Die moontlikheid dat *Ostertagia* spp. weerstand teen wurmmiddels mag opbou, moet derhalwe deeglik by die beplanning van wurmbeheer in hierdie gebiede in gedagte gehou word.

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BOOK REVIEW

BOEKRESENSIE

VETERINARY DRUG INDEX

BENJAMIN P. LEWIS and LEON O. WILKEN

1st Edn. W.B. Saunders Company, Philadelphia, Pennsylvania 19105. 1982 pp XXIX and 327, Price approximately R70,00 (ISBN 0-7216-5764-8).

This book is a compendium of pharmaceuticals, premixes and biologicals used in veterinary medicine in the United States of America. Products are listed in a therapeutic index, e.g. analgaesics, diuretics etc., and in a trade name index. There is also a generic and chemical name index which will be of more use in South Africa.

The body of the book is divided into 3 sections dealing with pharmaceuticals, premixes and biological products. There is, in addition an appendix dealing, inter alia, with drug laws of the USA, withdrawal times, conversion equivalents and an alphabetical list of drug manufacturers.

In the section on pharmaceuticals much useful information is to be found. Drugs are listed together with their trade names, routes of administration, pharmacological activity, indications, dosages and withdrawal periods. The sections on premixes and biologicals will be of little use in South Africa where very few of the products listed are available.

This book cannot be recommended for use by general practitioners because:

(1) It is aimed primarily for the market in the United States and only U.S. trade names are listed. Many veterinary products available locally are not listed.
(2) Drugs manufactured primarily for human use which are frequently used on animals are not listed, e.g. phenobarbitone, digoxin and insulin.
(3) Doses are still given in mg per pound.
(4) There has been no attempt to list side and toxic effects of drugs.

Despite the above the book will be of use as a reference to veterinarians in the drug industry, teachers of veterinary pharmacology and to individuals involved in drug control legislation.

C. Button

CATTLE MANGE: IMPORTANCE IN SOUTH AFRICA AND CHEMICAL CONTROL WITH THE ORGANOPHOSPHATE PHOXIM*

C.R. PALMER** and A. VAN AMELSFOORT**

ABSTRACT: Palmer C.R.; Van Amelsfoort A. **Cattle mange: Importance in South Africa and chemical control with the organophosphate phoxim.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 99-103 (En) Bayer South Africa (Pty) Ltd. P.O. Box 143, 1600 Isando, Republic of South Africa.

Cattle mange causes economic losses in South Africa. Two full efficacy trials and 6 field trials with phoxim demonstrated good efficacy against 3 species of mites causing cattle mange.

Key words: Cattle mange, control, phoxim.

INTRODUCTION

Tobin[6] states that *Psoroptes ovis* in feedlot cattle in the United States of America causes an average drop in mass gain of 0,25 kg per animal per day, the main effect being on feed intake which drops by 21,5 %, requiring 100 extra feeding days to reach the same mass as uninfested cattle. In 1962 when the disease was at a low ebb, it cost the U.S. $4,500,000.

According to Meleney[3] *P. ovis* can cause mortality in cattle under one year of age while Liebisch[2] states that *Sarcoptes scabei* is the most economically damaging parasite causing a 10-20 % mortality in Germany.

In South Africa a considerable loss in milk production in dairy herds is suspected but this is unproven as yet. Swan treated 3 Simmentaler X Fries cattle which were heavily infested with *S. scabei,* and 56 days later they had gained 35 kg more per head than the untreated controls (625 g/d). Two of the controls later died from the infestation (Swan 1981 personal communication).

EPIZOOTIOLOGY

In 1978 when sheep scab was at its worst in the Republic of South Africa, 240 outbreaks of cattle mange were reported, compared to 370 outbreaks of sheep scab in the same year.

Although there is no record of the species of mite involved in each outbreak of cattle mange, many are due to *P. ovis.* Many overseas authors state categorically that *Psoroptes sp.* on sheep and cattle are the same species, both morphologically and epizootiologically[3], although in the latter case the concensus is that the parasites do not readily transfer but require a period of close contact for adaptation[3 4].

Roberts & Meleney[4], also report that there are aggressive strains on infested sheep which do not affect cattle, while Zielasko[8] was able to experimentally transfer *P. ovis* collected from naturally infested cattle to 3 sheep where they multiplied for at least 35 days. He was also able to transmit the infestation from sheep to cattle and cattle to sheep by housing the animals together, but in no case did serious clinical signs occur after these transmissions.

Observations in the R.S.A. have led the authors to postulate that transmission within a cattle herd frequently occurs during mounting, where bulls with preputial or belly infestations or cows with belly infestations bring their lesions into close contact with the escutcheon and tailbase of susceptible cows. The areas mentioned are the most commonly infested, as is evident from Fig. 1.

In the case of *S. scabei* the possible role of other species in the transmission of the disease should be considered. On one property with severe sarcoptic mange amongst the dairy herd, a scraping from a piglet which free-ranged on the property proved positive for *S. scabei,* but scrapings from the sheep, dogs and the milkers on the same property were negative.

The sheep had some misleading wool loss along the backline but this proved to be due to their regular habit of crawling under fences (Fig. 2).

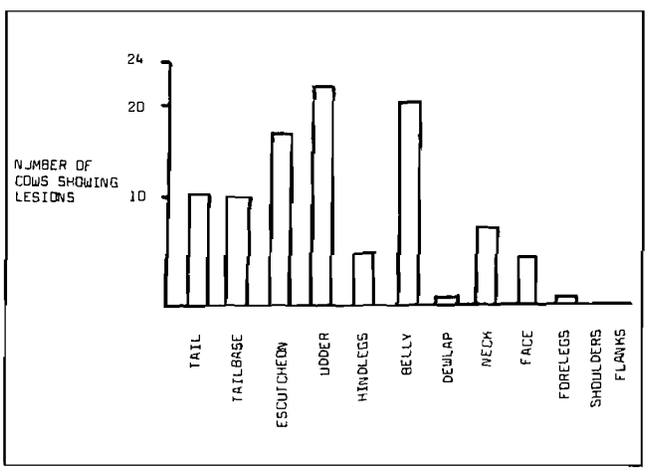

Fig. 1: Distribution of lesions in a herd of dairy cows chronically infested with *Sarcoptes scabei* and *Psoroptes ovis.*

DISTRIBUTION

At present cattle mange is still rare in the South African bushveld because of regular dipping with compounds which have some effect on the parasites. However, we have encountered 4 cases of chorioptic mange in bushveld herds regularly dipped with cypermethrin, flumethrin, amitraz and chlorphenvinphos/dioxathion combinations respectively. In the rest of the country and S.W.A./Namibia, infestation seems most prevalent in dairy herds, including some extremely well-managed herds as well as low quality beef herds and native catle.

We have encountered *S. scabei, P. ovis* and *Chorioptes bovis* in various parts of the Transvaal but the species involved in other provinces is not clear. Little attention is paid to the disease and many farmers make only token attempts to clear it up. The common

*Phoxim = Sarnadip^{R}, Bayer Leverkusen.

**Bayer South Africa (Pty) Ltd. P.O. Box 143, 1600 Isando.

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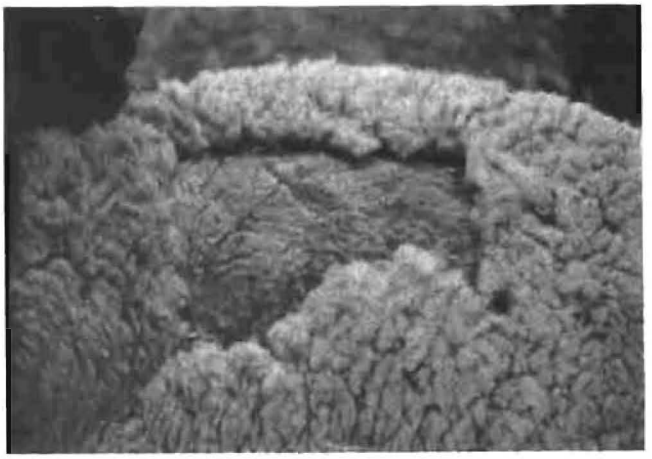

Fig. 2: Dorsal wool-loss in a flock of sheep grazing with mange-infested cattle proved to be due to their regular habit of crawling under fences, and not to any parasite.

Afrikaans word "skurfte" and "vuursiekte" are frequently applied to cattle mange, lice infestation and even ringworm, and a specific diagnosis is often not made.

In the United States and Canada *P. ovis* occurs in distinct epizootics amongst feedlot cattle. The disease does not appear to be prevalent in feedlots in South Africa but could become so.

DIAGNOSIS

The use of standard diagnostic techniques is important in establishing the presence of mites in order to select the most suitable chemical for treatment. A species diagnosis is often useful as *S. scabei* requires more treatments to effect a parasitological cure than does *P. ovis*, while *C. bovis* is the most resistant of the 3 to the modern acaricides.

This paper describes the results of 2 controlled and 6 field trials to establish the efficacy of phoxim against *S. scabei, P. ovis* and *C. bovis*.

TRIAL A: EFFICACY OF PHOXIM AGAINST *S. SCABEI* IN A DAIRY HERD.

MATERIALS AND METHODS

A dairy herd of approximately 130 dry cows and cows in milk was available for the main efficacy trial, of which some 35 animals were showing clinical signs of mange in varying degrees. The animals had been treated by the owner, who hand-washed the affected areas with diazinon 3 times a week. The dry cows, however, had not been treated. The last diazinon treatment as 2 weeks before Day 0 of this trial. Scrapings were then taken from the animals showing clinical signs as follows: A sharpened spatula was used and scrapings in liquid paraffin were taken from both the centre and the periphery of the lesion. The 2 scrapings were placed side by side on a large microscrope slide, which was then studied under a stereoscopic microscope and the number of live, dead, immature and adult mites as well as the number of eggs and the species of mite seen, was recorded.

All the parasites recovered initially were *S. scabei,* but subsequently a few *P. ovis* were seen. Only animals showing live parasites were selected for the trial. In this way 24 animals were selected and immediately identified by numbered ear tags. These animals were then ranked in order of severity of lesions, and then randomised using a table of 10,000 random numbers. They were then divided into 6 groups of 4. Five of these groups were treated, i.e. they were thoroughly sprayed with the various acaracides and concentrations listed in Table 1, using a high-pressure hand spray (500 Kpa). Neither hand scrubbing nor crust removal was done at any stage.

Spraying was repeated on Day +10 and Day +20, and further scrapings taken by the same method described above, 3 days after each treatment, and again 3 weeks after the last treatment.

RESULTS

The results are recorded in Table 1. Phoxim at all 3 concentrations gave a complete parasitological cure after 3

Table 1: NUMBERS OF CATTLE STILL SHOWING LIVE *S. SCABEI* OR *P. OVIS* MITES AFTER THE VARIOUS TREATMENTS

Chemical and Concentration	Number of cows in group	Number of positive cows				
		Day 0	3 d after first treatment	3 d after second treatment	3 d after third treatment	25 d after third treatment
Phoxim 500 ppm	4	4	0	1	0	0
Phoxim 250 ppm	4	4	0	0	0	0
Phoxim 1000 ppm	4	4	0	2	0	0
Diazinon 500 ppm	4	4	0	2	2	1
Untreated Controls	4	4	4	2	4	3
Quinthophos 200 ppm + Bromophos ethyl 400 ppm	4	4	2	4	4	2

Fig. 3: Chronic *S. scabei* infestation of the udder and belly of a Friesland cow.

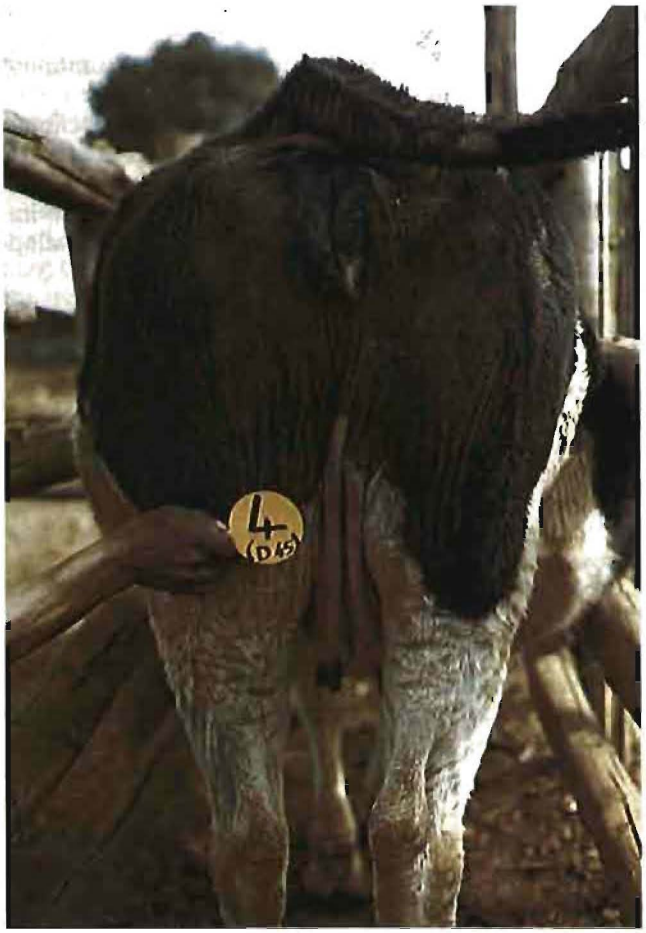

Fig. 5: The same cow illustrated in Fig. 4, 45 days after commencement of treatment with phoxim at 250 ppm repeated 3 times. At this stage the lesions had been parasitologically negative for 3 weeks, but complete clinical recovery was slow.

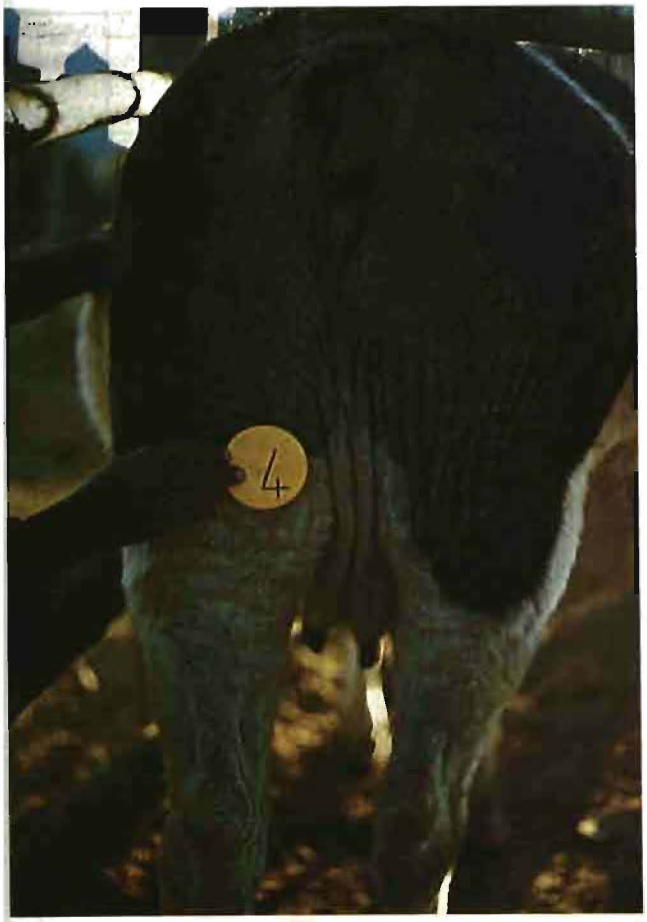

Fig. 4: A cow infested with *S. scabei* for 7 months.

Fig. 6: *Sarcoptes scabei* x 80.

treatments but not after 2. Two animals in the diazinon group were still positive after 3 treatments, as were all the animals treated with quinthiophos/bromophos ethyl, and all controls.

Due to the chronic nature of the lesions, a clinical cure was only seen on the more recently infested areas (neck, face, forelegs, etc.), while the chronically infested escutcheons, udders and bellies appeared to improve after one treatment, but later showed the development of new crusts.

TRIAL B: EFFICACY OF PHOXIM AND CYPERMETHRIN AGAINST *C. BOVIS.*

MATERIALS AND METHODS

A natural outbreak of *C. bovis* was diagnosed in the Western Transvaal, and 15 Simmentaler cows with escutcheon lesions selected. They were randomly divided into 2 treated groups and 1 control group. One group was treated with phoxim and in the other cypermethrin

Table 2: EFFICACY OF PHOXIM AND CYPERMETHRIN AGAINST *CHORIOPTES OVIS*

Chemical and Concentration	Number of cows in group	Number of positive cows		
		Day 0	7 d after first treatment	7 d after second treatment
Cypermethrin 150 ppm	4	4	4	4
Phoxim 500 ppm	4	4	0	0
Untreated controls	3	3	3	3

Table 3: FIELD EFFICACY OF PHOXIM AGAINST CATTLE MANGE

Area	Type of Farming	Type of Animals	No. infested	Total No. treated	Degree of infestation prior to treatment	Parasite	Apparatus used	Concentration used (ppm)	No. of treatments & intervals	Crust removal	Results
Koster	Extensive dairy herd	Friesland Jersey & crosses	±50	130	severe	S. scabei + a few P. ovis	Spray-race	1000	2 10/days	no	Complete
Krugersdorp	Intensive dairy herd	Friesland	3	40	severe	P. ovis	Spray-race	1400	5 weekly	no	Complete parasitological cure
Bethal	Intensive dairy herd	Friesland	6	180	very severe	P. ovis	Spray-race	950	2 8/days	no	Complete parasitological cure
Makoppa	Extensive beef	Simmentaler	1	1	escutcheon only	P. ovis	Stirrup pump	500	2 weekly	no	Parasitological & clinical cure
Otavi	Extensive beef		10	10	severe	P. ovis	Hand-spray	833	2 9/days	yes	Complete parasitological cure – lesions clinically inactive
Otjiwarongo	Extensive beef	Simmentaler	4	4	severe	P. ovis	Stirrup pump	500	± 3 10/days	no	Parasitological & clinical cure after 3rd treatment

was used as a reference compound at 150 parts per million (ppm) and applied with a high pressure hand spray. Only 1 animal in the cypermethrin group received a third treatment.

RESULTS

The results are recorded in Table 2. Phoxim at 500 ppm gave a complete parasitological cure after a single treatment. Cypermethrin failed to kill the parasites after 2 (and in one case, 3) treatments.

FIELD TRIALS

A number of field trials were conducted with the help of various co-operators. Only those where final scrapings were taken by veterinarians are recorded. Details of these trials are given in Table 3.

DISCUSSION

Farmers report that repeated sprayings with acaracides are required to effect a clinical cure and that manual removal of the crust is essential for high efficacy, which is impractical where large herds are infested.

Phoxim was chosen as a suitable insecticide for cattle mange control as it is known to be effective against *P. ovis* on sheep in South Africa. Overseas data also showed good results against *P. ovis* on cattle, and it was postulated that as phoxim has some systemic activity, it would reach deep-seated mites without the necessity of crust removal, which is impractical in large herds. For this reason, these trials were conducted without any scrubbing of crust removal at any stage.

Phoxim proved to be a very useful compound for mange control, as one treatment was completely effective against *C. bovis*. This parasite is refractory to cypermethrin and possibly also to other pyrethroids, and with the increasing popularity of pyrethroids as cattle dips *C. bovis* infestation may increase.

Chronic *S. scabei* infestation definitely requires more than one treatment. The first treatment with all compounds tested caused crust formation with deep-seated parasites flourishing beneath the new crusts. Phoxim was effective after 3 treatments, while diazinon and quinthiophos/bromophos ethyl were not.

Two treatments with phoxim were sufficient to cure *P. ovis* in 2 field trials. The 5 treatments required at Krugersdorp were probably due to poor wetting in the sprayrace. The farmer gave the first 4 treatments at 1,400 ppm but these were not supervised and left a few positive animals. We carried out the 5th treatment at 1,000 ppm and all parasites were destroyed.

Although mange is often seen in isolated animals in a herd, a herd approach should always be used when planning treatment. Particular attention should be given to the treatment of affected areas, where scrubbing with a brush dipped in the selected compound will increase penetration and therefore efficacy. Animals now showing signs should also be thoroughly wetted wth the acaracide.

The suspension applied in a sprayrace has difficulty in wetting areas in lactating dairy cows such as the udder and inner thigh which may be infested. By handspraying with a high pressure motorised pump, special attention can be given to these areas. For this reason handspraying is preferable to sprayrace application.

ACKNOWLEDGEMENTS

We wish to thank Dr C. Smith (State Veterinarian, Otavi) for the field trials in South West Africa/Namibia and Mrs E. Richter for the typing of the manuscript.

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CLINICAL AND ENDOCRINE STUDIES DURING NORMAL AND INDUCED PARTURITION IN MARES

H.M. TERBLANCHE*

ABSTRACT: Terblanche H.M. **Clinical and endocrine studies during normal and induced parturition in mares.** *Journal of the South African Veterinary Association* (1983) 54 No. 2, 105-113 (En) Department of Genesiology, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

Parturition was induced in 6 mares between Day 327 and 346 of pregnancy using oxytocin (Group I) and in 6 mares between Day 315 and 330 of pregnancy with fluprostenol in combination with oxytocin (Group II). A third group of 4 mares which served as controls were allowed to go to full term (322-340 days) and foal down normally. Parturition occurred within 24-102 min ($\bar{x}$ = 61,4; SD = 31,6) in 5 of the Group I mares and within 160-185 min ($\bar{x}$ = 173; SD = 10,86) in the mares of Group II. Expulsion of the afterbirth took place between 7 and 206 min ($\bar{x}$ = 79; SD = 76,38) and between 7 and 73 min ($\bar{x}$ = 37,5; SD = 21,29) in Groups I and II respectively.

Three of 6 mares in the oxytocin group showed foal heat, all 3 conceived and 2 carried foals to term. Of the remaining 3 mares, 2 showed heat approximately one month after parturition, and were served and conceived but one aborted due to babsesiosis and one resorbed while the third remained in anoestrus for 3-4 months. In the combined treatment group, 3 mares showed foal heat of which only 2 were served. Both conceived and one carried a foal to term. One of the remaining mares showed oestrus 2 months after parturition while the remaining 2 mares showed oestrus approximately one month after parturition. Both were served, one conceived but subsequently resorbed.

In the control group only one mare showed foal heat; she was bred and carried a foal to term. Two mares exhibited heat one month after foaling, only one was bred and conceived but resorbed. The fourth mare showed oestrus 2 months after foaling but was not served.

The mean plasma progesterone concentrations for the 3 groups on the day before parturition were 25,85 ± 4,96 nmol/ℓ, 24,04 ± 7,57 nmol/ℓ and 25,03 ± 4,58 nmol/ℓ respectively. At the time of parturition they were 23,85 ± 5,88 nmol/ℓ and 23,75 ± 6,88 nmol/ℓ in Groups I and II respectively and 23,82 ± 5,31 nmol/ℓ in Group III on the day of parturition. Thereafter the levels declined dramatically to reach 2,32 ± 1,05 nmol/ℓ, 0,73 ± 0,92 nmol/ℓ and 1,24 ± 0,92 nmol/ℓ one day after parturition in the 3 groups respectively.

The mean plasma oestradiol levels for the 3 groups at the same times as above were 0,67 ± 0,18 nmol/ℓ, 0,77 ± 0,17 nmol/ℓ, 0,63 ± 0,17 nmol/ℓ; 0,67 ± 0,31 nmol/ℓ, 0,71 ± 0,17 nmol/ℓ, 0,45 ± 0,08 nmol/ℓ and 0,25 ± 0,1 nmol/ℓ, 0,16 ± 0,16 nmol/ℓ and 0,12 ± 0,11 nmol/ℓ respectively.

Key words: Induced parturition, mare, oestradiol, oxytocin, progesterone, prostaglandin, reconception.

INTRODUCTION

The indications for induced foaling are well documented[9 12] as are the criteria to be used in assessing the readiness of the mare to be induced[12]. Induction of parturition in the mare has been achieved with the use of dexamethasone[1 2], oxytocin alone[9 13 15 16] or in combination with oestrogen[9], with prostaglandin[17] and a combination of corticosteroids, oestrogen and prostaglandin[21].

Some uncertainty surrounds the use of corticosteroids[1 12] and its use for induction of parturition in pony mares has met with variable success[5 6]. Although high doses of oxytocin are used as a rule[9 13], success with induction has also been achieved with relatively small doses[15 16].

Few critical studies have been performed on the effects of induction on the neonatal foal[12]. Malposture, weak foals and neonatal infections and deaths have been described[12] but the exact influence of induction at term and its role in the aetiology of neonatal maladjustment seems to be largely unknown. Pashen[15] has, however, speculated that myometrial spasm, premature placental separation and malpresentation, as seen in women given excessive oxytocin, may also occur in mares and could influence neonatal survival. Various authors have however, reported on the normal postnatal development in a high percentage of induced foals[1 9 13 15 16]. In this respect especially pony foals have fared better than thoroughbred foals[17]. The technique of induction should however be carefully selected and used with great care and possibly not on a routine basis[12 13].

The present study was undertaken to compare the properties of oxytocin and prostaglandin in combination with oxytocin to induce parturition. The role of prostaglandins in the termination of pregnancy and ensuing parturition is well known[4] but some discrepancy is evident from the literature because of somewhat conflicting reports[2 12 17]. In addition, the clinical and endocrine responses of these mares were compared and subsequently compared with those observed in normal parturitions. The reconception rates of the mares were also studied in order to determine the effect, if any, of induction on subsequent fertility.

MATERIALS AND METHODS

Animals

Sixteen adult multiparous Nooitgedacht mares of various ages and an average body mass of 472 kg (401-553 kg) were randomly divided into 3 groups. Group I consisted of 6 mares between Day 327 and 346 of pregnancy; Group II of 6 mares between Day 315 and 330 of pregnancy and Group III of 4 mares between Day 322 and 340 of pregnancy. The duration of pregnancy was calculated from the day of ovulation which was taken as Day 1 of pregnancy.

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Induction of parturition

The mares in Group I were treated with oxytocin (Oxytocin, Ciba-Geigy) as explained in Table 1 and the mares in Group II with fluprostenol (Equimate, I.C.I.) and oxytocin as detailed in Table 2. The mares of Group III served as untreated controls and were allowed to go to full term and foal down normally.

Table 1: INTRAMUSCULAR TREATMENT WITH OXYTOCIN (GROUP 1)

Mare	Duration of pregnancy (days)	Dosage I U
1	336	100
2	339	100
3	327	100
4	346	100
5	333	100
6	336	100

Clinical observations

The criteria for full-term induction described by Jeffcott & Rossdale[12] were generally observed with one exception in Group II. These criteria include a gestational length of >320 days, mammary development and the presence of colostrum in the gland and evidence of waxing on the teats. Rectal examinations were performed on the mares in Group I and II before induction and at selected times during the induction period on some mares in such a way as to prevent possible disturbance. Upon administration of the inducing agent, the mares were carefully observed and all clinical signs up to voiding of the afterbirth were noted against time lapse. The foals were observed for respiratory function, aibility to rise and initiate suckling and were weighed as soon as they could stand.

The mares were teased daily from the third day after parturition for 3-4 months. Those showing foal heat were served with one exception. Mares showing heat in the ensuing month were also served with again one exception. Rectal examinations for pregnancy were carried out at 25 d, 42 d and 60 d after service. Oestrus occurrence more than 2 months after foaling were noted but no services were allowed because of the lateness in the breeding season.

Endocrine studies

Sample collection

Blood was drawn daily in heparin at 08h00 from the jugular vein for one week prior to induction in Groups I and II including the day of induction. After induction, blood was similarly drawn at 30 min intervals from the induced mares from the time of treatment until voiding of the afterbirth was complete. Sample collection was carried out in such a manner as to cause minimal interference during especially the second stage of parturition. After parturition samples were collected daily at 08h00 for 3 d. Blood samples were also collected on a daily basis at 08h00 from the control mares starting 2-4 weeks before parturition and terminating 3 d after foaling.

Blood samples were centrifuged as soon as possible after collection, the plasma removed and stored at -20°C until assayed for progesterone and oestradiol content.

Hormone assays

Progesterone was determined with a competitive protein binding assay of proven reliability[19 20] and oestradiol with a commercial radioimmunoassay kit (Biodata, S.p.A.-Industrial Centre, Switzerland through the agent, Weil Organisation (Pty) Ltd., Johannesburg). The reliability of this assay was assessed by determining the oestradiol content of 10 replicate samples with a known oestradiol content at each of the following levels: 0,18; 0,37; 0,92; 1,84; 3,67 and 7,34 nmol/ℓ. All replicate samples were assayed in duplicate.

Statistical analysis

Statistical analyses were performed on a Hewlett-Packard HP97 calculator on their standard programmes for basic statistics.

RESULTS

Parturition was successfully induced in 5 of the mares in Group I and in all 6 mares in Group II. The average interval from treatment to parturition was 61,4 min (SD = 31,6; range 24-102 min) in Group I mares and 173 min (SD = 10,86; range 160-185 min) in Group II mares (see Tables 3 & 4). Induction resulted in dystocia in one mare in Group I (No. 3). This mare was examined for lack of progress 2 h after the initial oxytocin treatment and a diagnosis of dystocia due to malposture of the foetus (head and neck deviation) was made. This was corrected under general anaesthesia and a live foal was delivered. The rectal examinations performed before actual induction were found to be of limited value in determining the presentation and postural status of the foal at parturition. Similar examinations performed during the induction period indicated that the righting

Table 2: INTRAMUSCULAR TREATMENT WITH PROSTAGLANDIN AND OXYTOCIN (GROUP II)

Mare	Duration of pregnancy (days)	Fluprostenol dosage (μg)	Oxytocin dosage (I U) (interval from fluprostenol)	Oxytocin* dosage (I U) (interval from first oxytocin)
7	330	750	50 (2 hrs)	50 (30 min)
8	315	875	50 (2 hrs)	50 (30 min)
9	328	875	50 (2 hrs)	50 (30 min)
10	327	1000	50 (2 hrs)	50 (30 min)
11	323	1000	50 (2 hrs)	50 (30 min)
12	322	1000	50 (2 hrs)	50 (30 min)

*25 I U given intravenously

Table 3: RESULTS OF INDUCTION WITH OXYTOCIN

Mare	Duration of pregnancy	Interval between treatment and parturition* (min)	Interval between parturition and voiding of the afterbirth (min)
1	336	80	7
2	339	102	53
3	327	120[1]	345[1]
4	346	37	43
5	333	24	86
6	336	64	206
	$\bar{x}$ = 336,17 SD = 6,31	$\bar{x}$ = 61,4[2] SD = 31,6[2]	$\bar{x}$ = 79,00[2] SD = 76,38[2]

* Completion of parturition; foal still attached to mare by umbilical cord
1 Mare with dystocia – see text
2 Mare No. 3 not included
$\bar{x}$ = Mean
SD = Standard deviation

Table 4: RESULTS OF INDUCTION WITH PROSTAGLANDIN IN COMBINATION WITH OXYTOCIN

Mare	Duration of *pregnancy* (days)	Interval between *fluprostenol* treatment and parturition (min)	Interval between *first* oxytocin and parturition (min)	Interval between second oxytocin and parturition (min)	Interval between parturition and voiding of the afterbirth (min)
7	330	164	45	15	7
8	315	185	65	35	40
9	328	177	50	20	73
10	327	185	65	35	35
11	323	160	40	10	30
12	322	167	47	17	40
	$\bar{x}$ = 324,17 SD = 5,42	$\bar{x}$ = 173,00 SD = 10,86	$\bar{x}$ = 52,00 SD = 10,58	$\bar{x}$ = 22,0 SD = 10,58	$\bar{x}$ = 37,5 SD = 21,29

$\bar{x}$ = Mean
SD = Standard deviation

reflexes of the foal only occurred in the first stage of parturition shortly before foetal expulsion.

The clinical signs exhibited by the induced mares varied considerably. They included sweating, rolling, defaecation, urination and slightly haemorrhagic vaginal discharges. In 4 of the 12 induced mares (3 in Group II) the chorion appeared intact at the vulva during the second stage of parturition as a reddish "bag". In 3 of these cases the cervical star was quite prominent and in all 4 cases the chorion was cut to allow parturition to proceed. Some of the clinical signs are listed in Table 5. Voiding of the afterbirth was normal in both groups (Tables 3 and 4) occuring on average 79 min after parturition in Group I (SD = 76,38; range 7-206 min) and 37,5 min after parturition in Group II (SD = 21,29; range 7-73 min). The only exception to the rule was mare No. 3 in Group I (dystocia) where expulsion took place 345 min after removal of the foal.

The foals exhibited no respiratory distress at birth. Interference at this time was kept to a minimum to avoid premature rupture of the umbilical cord. All the foals were up within 45-75 min after foaling and initiated suckling within 1-2 h. The body masses of all the mares and foals are given in Table 6. From these figures it can be seen that although selection was random, the heavier mares produced the heavier foals irrespective of treatment. The majority of foals born were male; 83 % in Group I, 67 % in Group II and 75 % in Group III.

Table 5: CLINICAL SIGNS OBSERVED IN THE INDUCTION PERIOD

Clinical symtom	Interval between first treatment and appearance of symptom (min)		Number of mares showing symptom	
	Group I	Group II	Group I	Group II
Sweating	15 – 20	10 – 25	6	6
Rolling	15 – 30	20 – 30	4	4
Haemorrhagic discharge from vulva	30 – 60	110 – 150	3	2
Defaecation	20	10 – 40	2	5
Urination	20	–	2	0

Table 6: AVERAGE BODY MASS OF MARES AND FOALS IN KG. (± STANDARD DEVIATION)

Treatment Group	Mares	Foals
Group I	491,83 ± 56,48	40,58 ± 2,96
Group II	431,50 ± 20,7	36,33 ± 2,71
Control	475,00 ± 65,57	38,13 ± 7,55

Continued on page 110

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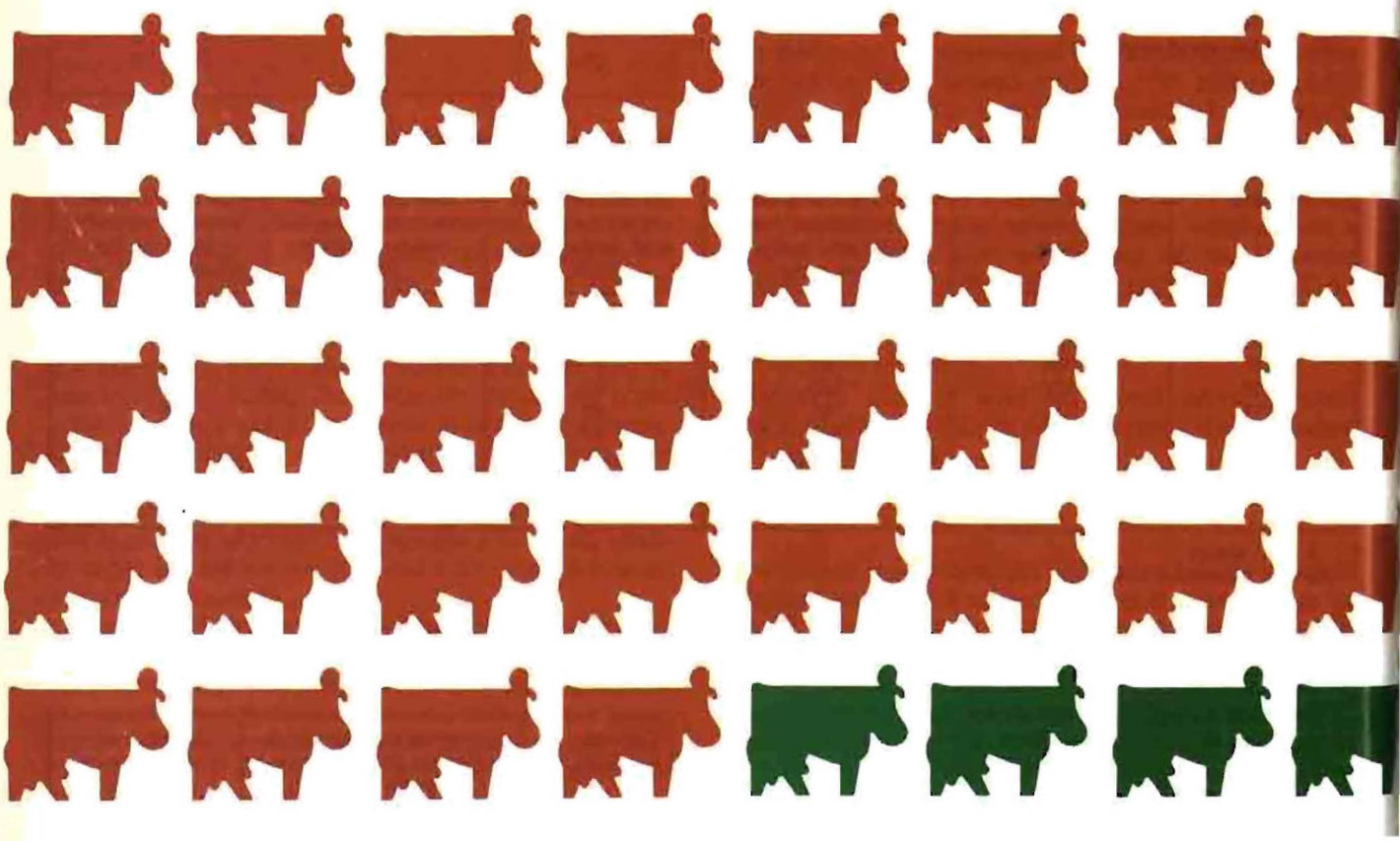

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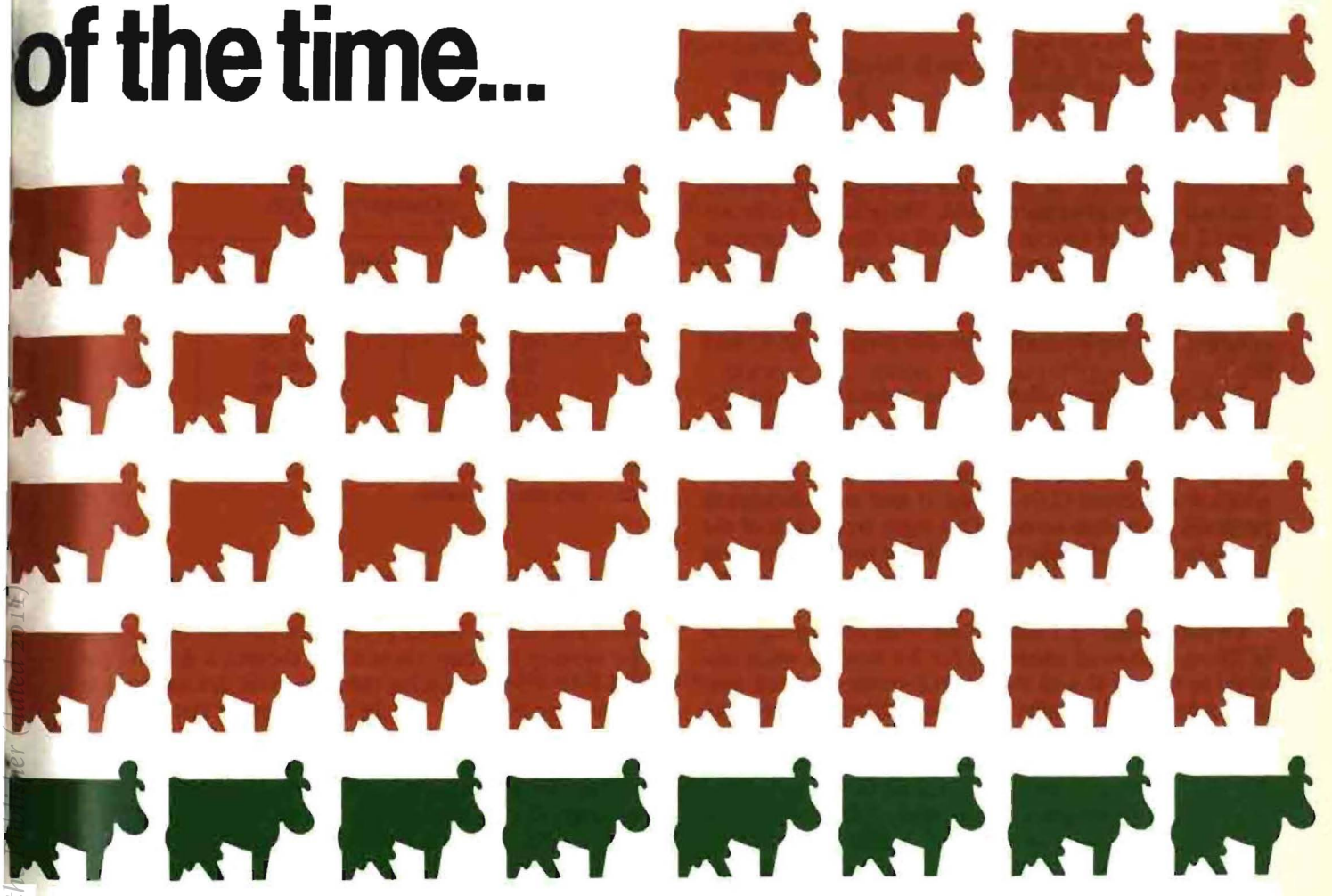

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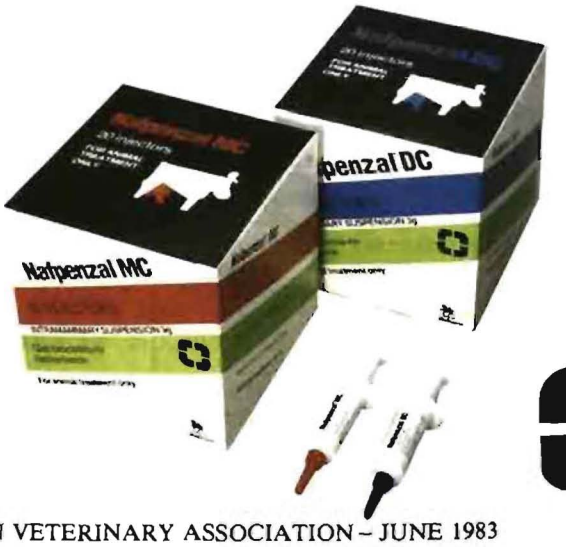

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Table 7: INCIDENCE OF FOAL HEAT, OTHER HEAT PERIODS, CONCEPTION RATES (CR) AND FOALING RATES (FR)

Group	Foal heat			Heat one month after parturition			Heat 2 months after parturition	Anoestrus (3-4 months)
	No. of mares	CR %	FR %	No. of mares	CR %	FR %	No. of mares	No. of mares
I	3	100	66	2	100	0[2]	–	1
II	3	100[1]	50	2	50	0	1	–
III	1	100	100	2	100[3]	0	1	–

[1]Only 2 mares were served
[2]One mare aborted at 5 months due to Babesiosis
[3]Only one mare was served

Three mares in each of the induced groups (50 %) and only one mare (25 %) in the control group showed foal heat 8-18 d after parturition. Three mares of Group I and 2 mares of Group II as well as the control mare were served. All 6 mares conceived with 2 of Group I and one of Group II and the control mare carrying foals to term. One mare from each of the 2 treatment groups resorbed and were found to be not pregnant at 42 and 60 d.

Two mares from each of the induced groups (± 33 %) and 2 (50 %) of the controls showed heat approximately one month after parturition. Two mares of Groups I and II and one control mare were served of which 4 conceived (2 in Group I) and were diagnosed pregnant 25 d after service. One mare from each of the 3 groups resorbed while the remaining pregnant mare in Group I aborted at 5 months due to Babesiosis. No foals were therefore born from these matings.

Of the remaining 3 mares (one from each group) one in Group I showed anoestrus for 3-4 months while one mare in Group II and the control group came on heat approximately 2 months after parturition but were not served. These results are tabulated in Table 7.

The reliability of the oestradiol assay used is given in Table 8. Since no overlap was found between the concentrations investigated, the assay was considered reliable for the measurement of oestradiol under the conditions of this study. The average oestradiol and progesterone levels recorded on the day before parturition, on the day of parturition and one day after parturition are detailed in Table 9. Oestradiol concentrations remained high (0,67-0,77 nmol/ℓ) until 24 h after parturition when they dropped to 0,12-0,11 nmol/ℓ. The oestradiol levels are explained in more detail in Fig. 1 where average levels are graphically depicted from 7 d before parturition and for 3 d after parturition.

Table 8: OESTRADIOL LEVELS DETERMINED IN 10 REPLICATE SAMPLES OF KNOWN OESTRADIOL CONCENTRATION

Expected oestradiol concentration nmol/ℓ	Assayed oestradiol concentration (SD) nmol/ℓ	Number
0,18	0,14 (0,08)	10
0,37	0,35 (0,13)	10
0,92	0,70 (0,09)	10
1,84	2,07 (0,70)	10
3,67	3,86 (0,47)	10
7,34	6,83 (0,45)	10

SD = Standard deviation

Average progesterone concentrations ranged between 9,54 and 15,9 nmol/ℓ in the control mares during the third and fourth weeks preceeding parturition. During the ensuing few days these levels showed a gradual rise and 8-10 d before foaling they increased dramatically to an average of 23,87 ± 1,28 nmol/ℓ in the last few days before spontaneous birth.

Average progesterone levels were also found to be elevated before as well as at the time of parturition in all 3 groups (23,75-25,85 nmol/ℓ). These levels were however, markedly reduced 24 h later averaging 0,73-2,32 nmol/ℓ. These results are shown in greater detail in Fig. 2 and Table 9. Standard deviations (SD) are omitted from Fig. 1 & 2 to avoid confusing overlap.

DISCUSSION

The results of this study in terms of the efficiency of induction compared very well with those reported by other workers[9 12 13 15 16 17 21]. The time interval between

Table 9: AVERAGE OESTRADIOL AND PROGESTERONE LEVELS ON THE DAY BEFORE PARTURITION, ON THE DAY OF PARTURITION AND ONE DAY AFTER PARTURITION

	Oestradiol nmol/ℓ ± SD			Progesterone nmol/ℓ ± SD		
	Group I	Group II	Group III	Group I	Group II	Group III
Day before parturition	0,67±0,18	0,77±0,17	0,63±0,17	25,85±4,96	24,04±7,57	25,03±4,58
Around parturition*	0,67±0,31	0,71±0,17	0,45±0,08	23,85±5,88	23,75±6,68	23,82±5,31
Day after	0,25±0,1	0,16±0,16	0,12±0,11	2,32±1,05	0,73±0,92	1,24±0,92

SD = Standard deviation
* = At the time of parturition in Groups I and II and on the day of but before parturition in Group III

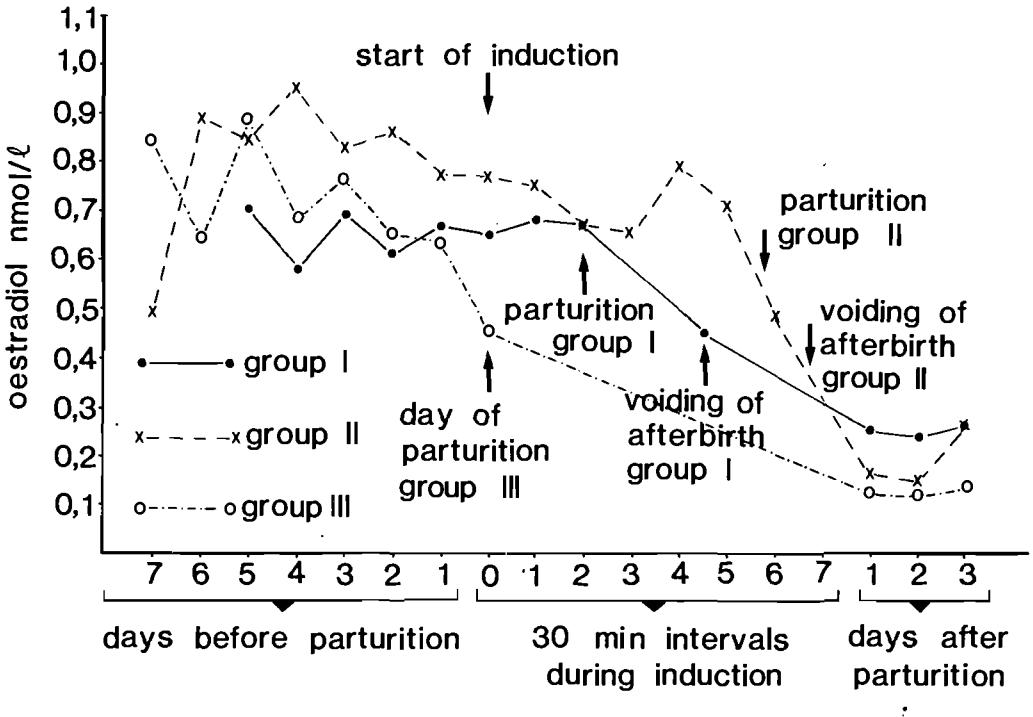

Fig. 1: Average oestradiol concentrations before, during and after induced and normal parturition

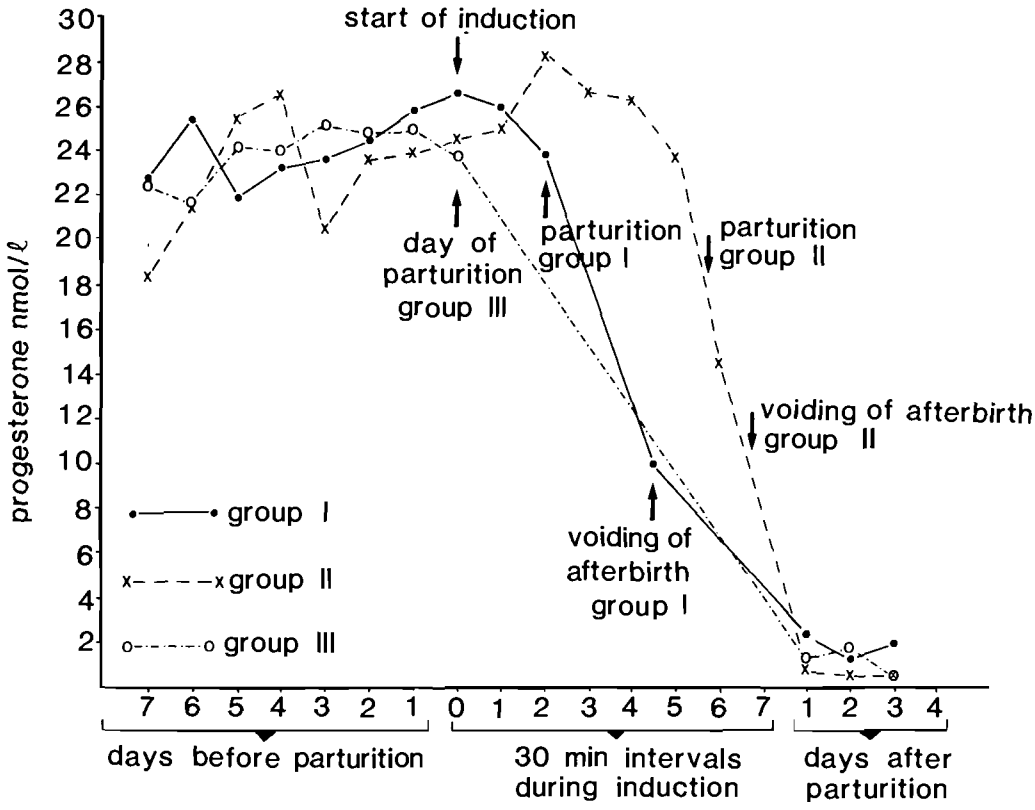

Fig. 2: Average progesterone concentrations before, during and after induced and normal parturition

administration of the inducing agent and foaling observed in this study is also in agreement with the existing literature for oxytocin[9 12 13 15 16] and prostaglandins[12 17 21]. The occurrence of a single case of dystocia in Group I (8 % of the total) is unexplained although not inconsistent with existing literature.

Jeffcott & Rossdale[12] reported a 66 % incidence when using dexamethasone, 25 % when using oxytocin as an intravenous infusion and a zero incidence with fluprostenol. The latter has also been reported by Rossdale et al.[17]. Klug & von Lepel[13] reported an 11 % incidence with oxytocin as the inducing agent while Pashen[15] and Paufler[16] experienced no dystocias when using small intravenous doses of oxytocin.

The righting reflexes of the foal observed during the first stage of labour shortly before expulsion are consistent with the views expressed by Jeffcott & Rossdale[12]. The use of a rectal examination to assess foetal presentation and posture as an indication of the readiness of a mare to be induced[9 13] cannot therefore be accepted.

Sweating and rolling were the 2 most consistent clinical symptoms following administration of the inducing agent. This finding is in agreement with other reports[9 12 15 17]. The interval between parturition and voiding of the afterbirth in both experimental groups of this study, was accepted as being normal and compares favourably with the results of others[15-17 21]; in fact, present results indicate a shorter interval than those reported previously[15 17]. These results differ from those of Hillman[9] and Klug & von Lepel[13] who reported a low incidence of retained placentas.

The high rate of foal survival found in this study agrees favourably with the results of many other workers[6 9 12 13 15-17]. Contrary to these results, various reports have mentioned weak foals at birth[1 2 12], early neonatal deaths[2 12], increased incidence of early neonatal infections[9] and trauma during the birth process[17]. It can be argued that the process of induction may cause the first stage of parturition to proceed too rapidly thereby not allowing the mare sufficient time to dilate and/or preventing the foetal foal from completing the necessary postural changes during the accelerated first stage and thereby reducing its ability to be born physiologically and hence reducing its chances of neonatal survival.

Excessive amounts of oxytocin can cause hyperstimulation of the myometrium, myometrial spasm, premature placental separation and malpresentation in the human[15]. It is conceivable that these may also occur in oxytocin induced foalings[15] thereby reducing the neonatal survival rate by possibly interfering with the foetal circulation and/or respiratory function immediately after birth.

The low incidence of foal heat in the control group (25 %) could possibly have been due to the advanced stage of the breeding season when these mares foaled. For the same reason some mares were not served at foal heat nor during the subsequent heat periods. The 100 % conception rate and subsequent 60 % foaling rate obtained from foal heat breeding indicate that induction of parturition had no effect on subsequent fertility. This is in agreement with the results of Hillman[9]. The poor results achieved with services during the first heat period approximately one month after parturition in all 3 groups may once again be due to the late stage of the breeding season.

The gradual decline in oestrogen levels during the last few days before parturition reported by others[17] was also found in the present study. This also holds true for the very dramatic drop seen following the actual birth of the foal[17 21]. It confirms the thoughts expressed that the foetoplacental unit acts as the major source of circulating hormones at this stage. The concentrations found in this study are however lower than those reported elsewhere[21] since only oestradiol was measured in this study compared to total unconjugated oestrogens. The oestrogen levels were essentially the same in all 3 groups of this study indicating that induced parturitions closely follow a physiological course.

Progesterone levels 3-4 weeks before parturition found in this study are in agreement with a previous study[20] and the increase in progesterone levels observed shortly before parturition is in general agreement with the results of other workers[7 8 10 11 21]. The stage at which the increase occurred however, differed quite drastically from that reported by Ganjam & Kenney[7] and Ganjam et al.[8]. They observed an increase from at least 9 weeks before parturition. This also holds true for the findings of Holtan et al.[10 11] who reported an elevation of progesterone levels approximately 30-40 d before parturition. Contrary to these findings[7 8 10 11] and the results of the present study, van Niekerk & Morgenthal[21] reported a rise in progesterone levels only some 24 h before parturition.

The actual concentrations found in this study also differ from those reported in the literature. This is probably due to different assay techniques and to whether progesterone or total progestagens are measured. Values reported in the present study relate to progesterone alone. The increase in progesterone (and oestradiol) levels following administration of fluprostenol observed by Rossdale et al.[17] was also observed in the present study. The high levels of progesterone found at the time of parturition in the present study are also in agreement with those of other workers[3 7 8 10 11 14 17 21] although not as high as those reported by some[3 21]. Once again this confirms the idea previously mentioned that the foetoplacental unit seems to be the major source of circulating steroids at this time[17]. The progesterone levels of all 3 groups in this study were essentially the same once again indicating that induced parturitions closely follow a physiological course.

The exact mechanism of action of the inducing agents is largely unknown. Oxytocin is known to cause membrane depolarization of the myometrium[4] thereby causing uterine contractions. It is also known that prostaglandins have the same effect[4] and that prostaglandin $F_{2\alpha}$ actually increases tremendously in the peripheral circulation of mares at the time of parturition[18]. It has also recently been shown that oxytocin administration causes a 20-35 fold increase in 13, 14, dihydro-15-oxoprostaglandin $F_{2\alpha}$ which is the major metabolite of prostaglandin $F_{2\alpha}$[15]. These findings would tend to confirm the fact that induction of parturition with oxytocin and/or prostaglandins will lead to a physiological birth. This has partially been confirmed by our findings.

It can be concluded that oxytocin and prostaglandin combined with oxytocin can be used as a safe method of inducing parturition in Nooitgedacht mares. The use of prostaglandin and oxytocin combined resulted in a higher degree of synchrony although the interval between administration and birth was much longer than with oxytocin alone. Critical evaluation of the techni-

ques for induction of parturition in thoroughbred mares and the concept of foetal and neonatal physiology in relation to neonatal survival needs to be critically researched.

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BOEKRESENSIE / BOOK REVIEW

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THYROID STATUS, OESTRADIOL LEVEL, WORK PERFORMANCE AND BODY MASS OF OVARIECTOMISED BITCHES AND BITCHES BEARING OVARIAN AUTOTRANSPLANTS IN THE STOMACH WALL*

P.H. LE ROUX**

ABSTRACT: Le Roux P.H. **Thyroid status, oestradiol level, work performance and body mass of ovariectomised bitches and bitches bearing ovarian autotransplants in the stomach wall.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 115-117 (En) Richmond Animal Hospital, Hermitage Terrace, Richmond, 2092 Johannesburg, Republic of South Africa.

The effects of ovariectomy and autotransplantation of the ovaries to the portal vein drainage area (ATOPA) were studied in 45 bitches. Parameters obtained were thyroid function, oestradiol level, work performance and body mass. At 35 weeks post-operatively no change could be shown in work performance; at 55 weeks body mass was unchanged; at 55 weeks oestradiol level and thyroid function were reduced in ovariectomised subjects and normal in ATOPA subjects. It is concluded that ATOPA may prevent the development of the post-ovariectomy eunuchoid syndrome.

Key words: Bitches, body mass, eunuchoid syndrome, oestradiol level, ovarian autotransplantation, ovariectomy, thyroid function, work performance.

INTRODUCTION

It has been stated that in bitches autotransplantation of the ovaries to the portal vein drainage area (ATOPA) abolishes the oestrus cycle and yet maintains the level of circulating oestradiol (E_2)[13]. The effects of ovariectomy and subsequent oestradiol level on adrenal cortex function have been reported[5 7 13 16]. The role of E_2 in the thyroid status of animals has been reported[2 6], but the methods previously available could not be used in dogs[4 13]. Behavioural studies of laboratory animals to determine the effects of ovariectomy had established the role of E_2 in behavioural patterns[9 18]. Many practising veterinarians believe that ovariectomy "changes the character" of bitches. Obesity has been studied in ovariectomised bitches[1 3 8 11 14 15 17]. In these reports the changes which are ascribed to ovariectomy are referred to as "hypogonadism". Because the subjects did not have hypofunctioning gonads but lacked gonads altogether, this term is inappropriate. A better descriptive term for the gross changes seen after ovariectomy would be the "eunuchoid syndrome".

In spite of the vast number of reports and references in veterinary textbooks the emphasis has hitherto been placed on obesity, skin disorders and urinary incontinence: the underlying endocrinological disease has been ignored.

MATERIALS AND METHODS

Subjects

The bitches consisted of 2 Dobermanns, one Bouvier and 42 German Shepherd dogs. They ranged in age from 9-12 months and were untrained. All had passed a physical examination and an acceptance test and were regarded as suitable for training as patrol dogs. Identical housing was provided in pens for individual dogs. A fixed amount of commercial dog ration (Dogmor, Glenmor, Randfontein) was fed once daily. Megestrol acetate (Ovarid, Glaxo, Greenford, England) was dosed per os at a rate of 0,5 mg/kg/d for 42 days. The standard South African Defence Force (SADF) training course for dogs was completed during this period. The bitches were then tested to establish their compatibility with their handlers and their obedience and proficiency at obstacle course work. The results were recorded on the standard score sheets used by the SADF. On the basis of these scores, it was considered that all 45 subjects would be used as patrol dogs.

Control group

Fifteen bitches were selected for eventual use in the breeding establishment of the SADF. The scores in the tests described above were used as the basis for the selection as well as conformational and other criteria.

Ovariectomy and transplant groups

Fifteen white and 15 black bands were handed at random to the handlers to be placed on their bitches. It was then decided arbitrarily that the animals in the black group would have ovariectomies while those in the white group would undergo the operation for ATOPA.

Pre-Operative body mass

This was recorded on the day of surgery.

Surgical treatments

All treatments were completed in 2 days.

Control group: a sham operation was performed that consisted only of a laparotomy.

Ovariectomy group: the ovaries were removed and the uteri left in situ in all the subjects except one which had a panovariohysterectomy because of the presence of a mucocoele.

Transplant group: bilateral ovariectomy was done, the ovaries were placed on a gauze swab and cut into transverse slices 1 mm thick and then by 2 sagittal cuts into small blocks held together by strands of tissue at the hilus. A subserosal or intermuscular pouch was formed on the greater curvature of the stomach. Both ovaries were slid into the pouch and the incision was closed with catgut size 000. To prevent possible adhesion of the graft site to the parietal peritoneum, part of the omentum was tacked over the site. The uteri were left in situ.

*This article is a summary of the dissertation: "The Endocrine status and working ability of ovariectomised bitches and bitches with ovarian autografts into the gastric serosa" which was compiled in partial requirement for the M Med Vet (Med) degree, University of Pretoria.

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Post-operative care

For one month after surgery the subjects were confined to their pens. They were physically examined and found to be fit.

Training

All the bitches were again put through a standard 6 weeks' training course. No medication was given and the groups were mixed and given to different handlers. Thereafter the bitches were used to train groups of novice handlers from various branches of the SADF. During this period one subject from the ovariectomy group and 2 from the transplant group were found to be too nervous to be used as patrol dogs and were discarded. This is not an unusual occurrence in dog training.

Assessment of work performance

Thirty-five weeks after surgery a team of experienced handlers was given one hour with the dogs for familiarisation whereafter each handler and dog was tested according to the identical criteria by the same examiners as before.

Post-operative body mass

This was measured 55 weeks after surgery.

Blood samples

Fifty-five weeks post-operatively 10 ml of blood was drawn from the cephalic vein into an evacuated glass tube (Venoject, Terumo Corporation, Tokyo and allowed to stand until it had coagulated. The serum was then separated by centrifugation from the clot and stored at -20°C.

Endocrinological assays and estimations

Oestradiol-17-beta was estimated by a method reported previously[10 19].

Thyroid status was determined by means of Gamma Coat ^{125}I T_4 for total thyroxine (TT_4), ^{125}I T_3 for total tri-iodothyroxine (TT_3) and ^{125}I T_3 uptake kits for tri-iodothyroxine uptake (T_3U) (Travenol Laboratories Inc., Clinical Assays Division, Cambridge, Mass). The free thyroxine index (T_7) was calculated from the results of TT_4 and T_3U.

RESULTS

Body mass

No significant differences were found between the 3 groups at any stage.

Work performance

A slight post-operative superiority seemed to be evident in the transplant group when the figures were analysed by means of the Student t-test. Further investigation by analysis of variance and least significant differences showed that the transplant group was superior in obedience pre-operatively and in obstacle course work post-operatively. This made it impossible to draw conclusions from the results.

Endocrine status

Oestradiol-17-beta

Oestradiol-17-beta was slightly higher in the transplant group ($p < 0,01$) and significantly lower in the ovariectomy group ($p < 0,0025$), when compared with the control group. The standard deviation was largest in the control group and lowest in the ovariectomy group.

Table 1: MEAN E_2 p MOL/ℓ 55 WEEKS POSTOPERATIVELY

No.	SUBJECTS	E_2	SD
15	Control	34,4	5,2
14*	Ovariectomy	28,2	3,6
13*	Transplant	39,3	4,1

*One subject from the ovariectomy group and two from the transplant group were discarded as patrol dogs because of extreme nervousness.

Thyroid status

T_3U was reduced in the ovariectomy and transplant groups ($p<0,0005$). TT_4 was slightly reduced in the ovariectomy group ($p<0,0125$). T_7 was similar in the control and transplant groups ($p<0,025$) but was significantly reduced in the ovariectomy group ($p<0,0005$). TT_3 did not differ significantly.

The standard deviations for T_3U, TT_4 and T_7 were largest in the control group and lowest in the ovariectomy group.

DISCUSSION

Body mass

Obesity did not occur among the bitches investigated during the period of observation. This may mean that polyphagia and disinclination to exercise may be the factors which cause mass gain in ovariectomised household pets that are left to their own devices. The experimental subjects were all fed the same fixed quantity of food and exercised vigorously.

Work performance

A defect in the method of obtaining this statistic was that the dogs were on a lead or under the direct control of a handler at all times, so that the scores may have been influenced. Complete randomisation of this

Table 2: THYROID EVALUATION TEST 55 WEEKS POST-OPERATIVELY

No.	SUBJECTS	T_3U %	SD	TT_4 n mol/ℓ	SD	T_7	SD	TT_3 n mol/ℓ	SD
15	Control	62,9	3,2	39,5	12,1	24,9	7,4	1,2	0,3
14*	Ovariectomy	52,3	1,7	30,6	5,6	16,0	2,9	1,16	0,3
13*	Transplant	53,5	1,8	35,8	8,3	19,8	4,2	1,5	0,4

*Footnote, Table 1.

statistic had not been achieved in the 3 groups at the outset of the experiment.

Endocrine status

The results indicate that the thyroid status is influenced by ovariectomy and ATOPA. The values of E_2, T_3U, TT_4 and T_7 show large standard deviations in the control group and small ones in the ovariectomy group. It is believed that the low but steady level of E_2 present in ovariectomised bitches produced this effect.

The high level of E_2 in the transplant group indicated that the ovarian grafts were active one year post-operatively. The reduced level of E_2 in the ovariectomy group correlated with a reduced T_7.

At the time that this investigation was carried out (1978) the Gamma Coat ^{125}I T_3U test and TT_4 test were the only reliable means of obtaining a free thyroxine index (T_7) in dogs' serum. The values obtained in hypothyroid dogs were considerably lower than those in the ovariectomized group (P H le Roux, unpublished data). Although they are not hypothyroid, ovariectomised bitches have T_7 values which fall in the low range of normal. The high T_3U value obtained in the transplant group may have been caused by the fact that the liver, which synthesises T_4-binding proteins, was receiving the total E_2 output of the transplant[13]; E_2 is known to raise this value in humans.

CONCLUSIONS

The results indicate that there is a direct relationship between the level of E_2 and thyroid function. It has previously been reported that ovariectomised bitches seem to benefit in various ways from a maintenance dose of ethinyl oestradiol at 5-10 $\mu g/kg/d$[12].

ATOPA, whereby E_2 and T_7 are maintained at normal levels, is a practical alternative to ovariectomy. Experience gained in practice since 1972 shows that occasional short periods of pro-oestrus and mild interest in ATOPA bitches shown by males may create a problem in households where both males and females are kept. If it is eventually proved that the ovarian autotransplant survives for the lifetime of the bitch, this procedure may be a solution to the problem of post-ovariectomy eunuchoidism.

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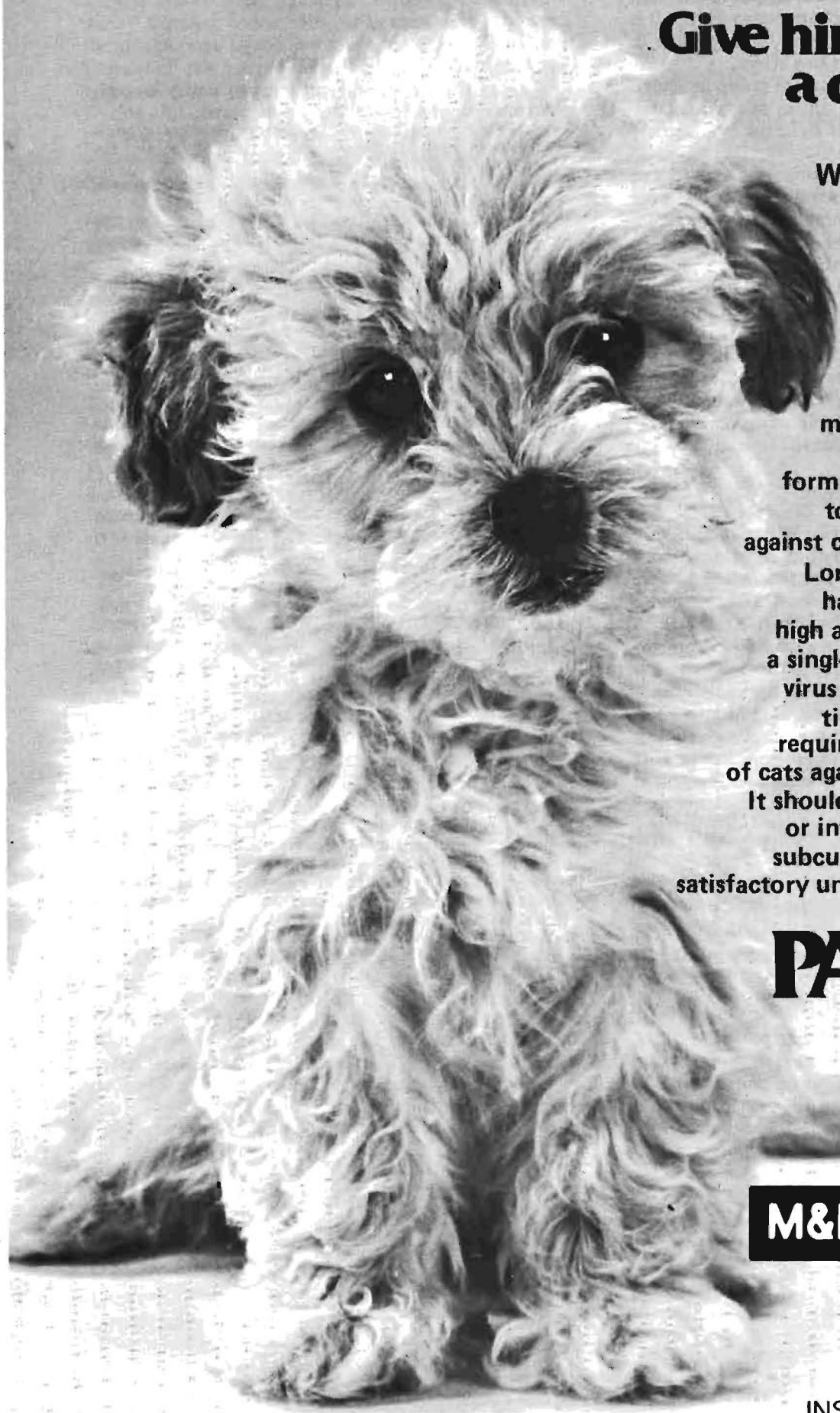

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OVARIAN MORPHOLOGY OF THE SPRINGBOK, *ANTIDORCAS MARSUPIALIS*

D.A. ELS*

ABSTRACT: Els D.A. **Ovarian morphology of the springbok, *Antidorcas marsupialis*.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 119-121 (En) Department of Zoology, University of Pretoria, Brooklyn, 0002 Pretoria, Republic of South Africa.

The ovarian morphology of the springbok is described, using material of 1 290 ewes collected at the De Beers farm, Benfontein. A deep longitudinal recess occurred in foetal ovaries. The right ovary was slightly larger than the left ovary according to its linear and mass measurements. Considerable distortion of the amygdaloidal ovarian shape occurred in the presence of a protruding corpus luteum. Ovaries were much flattened during advanced pregnancy. A description of the appearance of intra-ovarian corpora observed in macroscopical sections is given. No predilection for the site of ovulation was observed.

Keywords: Springbok, *Antidorcas marsupialis*, ovary.

INTRODUCTION

The morphology of the springbok ovary has not yet been described. Mossman & Duke[8] recorded 2 types of ovarian shapes (amygdaloidal and reniform) among a number of Bovidae which included the springbok but did not state which of the 2 shapes was typical of the springbok ovary. The only other published information on the springbok ovary is a brief mention of follicular growth and ovulation rates[16]. It is the purpose of this project to obtain a better understanding of ovarian morphology of the springbok.

MATERIAL AND METHODS

An investigation was carried out on ovaries of 1 290 springbok ewes collected during 1970-1974 at the De Beers' farms in the Kimberley district (approximately 28°40'-28°50'S and 24°40'-24°49'E). Ageing of post-natal animals (i.e. from birth to adult) was done by tooth wear and replacement following Rautenbach[11] while foetal age was calculated using the Huggett & Widdas formula[5].

The ovaries were preserved by fixation in 10 % formalin, AFA[1 7] or Bouin's fluid. In a few cases whole reproductive tracts and foetuses were also preserved. Using vernier callipers all linear measurements were taken following the method of Trauger & Haugen[17]. The mass of the ovaries was measured on a Mettler balance and the ovaries subsequently investigated with a stereo dissecting microscope for the presence of ovulation scars. Counts were made of ovulation scars close to the hilus, sagittal ridge and lateral sides. Rowlands[12] initially used the product of 3 diameter measurements as an indication of volume. During the present study, this formula of a cube was regarded to be unsatisfactory, therefore the volumes of ovaries were calculated using the ovoid sphere formula suggested by Rashevsky[10]. This formula is similar to that used by Gibson[2], Rowlands[13] and Rowlands & Heap[14].

RESULTS

Both foetal and post-natal ovaries (especially of immature ewes) have an ovoid shape. The foetal ovary has a deep recess over its long axis on the side which is attached to the mesovarium. In the post-natal ovary this mesovarian side forms the hilus which is less rounded than the opposite free border. Foetal and post-natal ovaries are generally slightly flattened on their sides. The abovementioned ovarian shape is clearly reflected by the linear measurements of the ovary (Table 1). From both linear and mass measurements of springbok ovaries it is evident that the right ovary is on average slightly larger than the left ovary (Table 1), and ovaries of pregnant animals are larger than ovaries of non-pregnant animals (Table 2). Moreover from Age Groups I to V (according to Rautenbach[11]) the ovarian size shows a fivefold increase (Table 2). At term when the uterus is extremely expanded the ovaries become flat ovoid structures.

Corpora lutea cause considerable distortion in the ovarian shape (Fig. 1), especially in the vicinity of the ovulation scar where the corpus luteum may cause a simple bulge or protrude. Most of the protruding corpora lutea have a mushroom shape while others have an ovoid shape (Fig. 2). These corpora lutea as well as corpora albicantia, follicles and blood vessels are easily recognized in macroscopic slices of the ovaries (Fig. 2). The corpus luteum normally has a whitish-yellow to dark yellow colour, corpora albicantia are brown to orange, blood (whether it is a blood vessel or a corpus haemorrhagium) is black, follicles have distinct walls and the follicular fluid has a transparent jelly-like appearance. The atretic nature of some follicles is macroscopically visible due to their irregular follicular walls.

Ovulation scars vary considerably depending on the stage of corpus luteum development as well as the presence or absence of this gland. Scars that are not associated with a current corpus luteum are small (0,5 mm in diameter) and appear as shallow depressions with irregular linings or they form irregularly shaped mounds. In 71 ovarian sets the average number of ovulation scars were similar for both left and right ovaries. Most of these ovulation scars were colourless (1,41 per ovary), some were light brown (0,57 per ovary) and some were yellowish (0,35 per ovary). Counts of ovulation scars located on the facies lateralis and medialis as well as hilus and the opposite free border showed no clear difference in the frequency of occurrence of ovulation scars at these localities. Ovulation scars were only observed in ovaries of animals in Age Group II to V. Only a few animals in Age Groups II and III had any ovulation scars (not more than one per ovarian set) while the ovaries of animals in Age Groups IV and V respectively had 1,92 and 2,15 scars per ovary.

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Table 1: LINEAR MEASUREMENTS, VOLUME AND MASS OF THE SPRINGBOK OVARY

Side	Number and mean of each linear measurement						Ovoid sphere volume (ml)	n	Mass (g)
	n	Length (cm)	n	Width (cm)	n	Height (cm)			
Left	161	1,357	162	0,780	162	0,959	0,53	631	0,49
Right	148	1,369	148	0,798	148	1,023	0,58	636	0,53
Both	429	1,379	430	0,786	430	0,936	0,53	1290	0,51

Fig. 1: Two ovaries with distinct protrusions (p) of their corpora lutea: one with a terminal and one with a sagittal protrustion. Scale in mm.

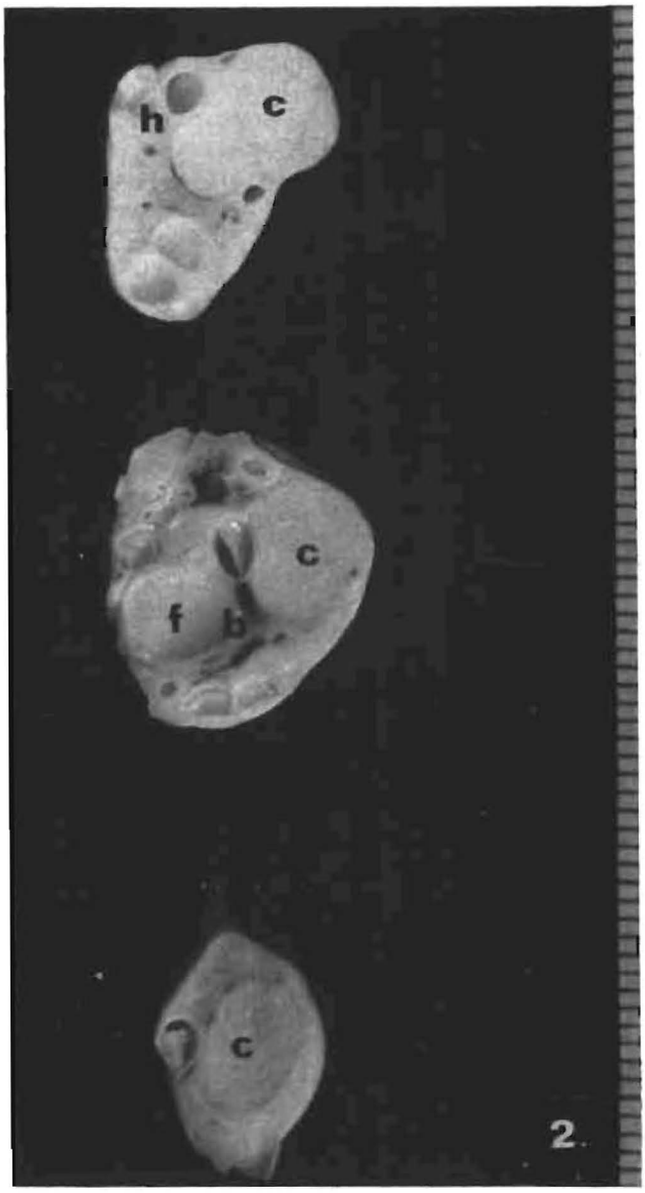

Fig. 2: Macroscopical slices of 3 ovaries each containing a corpus luteum (c). The corpus luteum at the top of the figure is mushroom shaped, the middle one causes a slight sagittal bulge and the bottom one is not in contact with the ovarian surface. The ovary at the top of the figure has one large and several small corpora haemorrhagea (h). The ovary in the middle of the figure has several large blood vessels (b) and a large vesicular follicle (f) is shown. All the small follicles of this ovary as well as the ovary at the bottom of the figure are visibly atretic. Scale in mm.

Table 2: AVERAGE MASS AND VOLUME OF OVARIES FROM PREGNANT AND NON-PREGNANT SPRINGBOK EWES ACCORDING TO AGE

Ewe Age Group*	Non-pregnant			Pregnant			Pregnant and non-pregnant		
	n	Volume (ml) mean ± S.D.	Mass (g) mean ± S.D.	n	Volume (ml) mean ± S.D.	Mass (g) mean ± S.D.	n	Volume (ml) mean ± S.D.	Mass (g) mean ± S.D.
I	1	0,17	0,16	—	—	—	1	0,17	0,16
II	19	0,32 ± 0,11	0,31 ± 0,11	7	0,39 ± 0,13	0,31 ± 0,12	26	0,34 ± 0,16	0,31 ± 0,11
III	9	0,40 ± 0,12	0,38 ± 0,15	18	0,64 ± 0,09	0,59 ± 0,10	27	0,56 ± 0,09	0,52 ± 0,02
IV	14	0,47 ± 0,25	0,42 ± 0,24	27	0,67 ± 0,26	0,68 ± 0,28	41	0,60 ± 0,25	0,59 ± 0,26
V	8	0,88 ± 0,10	0,81 ± 0,09	32	0,80 ± 0,38	0,74 ± 0,34	40	0,81 ± 0,34	0,75 ± 0,29

*Grouped according to the classification of Rautenbach[11]

DISCUSSION

Springbok ovaries are ovoid structures which are laterally slightly flattened. Their shape is therefore intermediate between those of cattle (*Bos taurus*) and sheep (*Ovis aries*) ovaries described by Sisson & Grossman[15] and could be classified as amygdaloidal together with a number of other Artiodactyla mentioned by Mossman & Duke[8]. The overall length of the springbok ovary (1,38 cm) is of the same order as that of the impala, *Aeypyceros melampus* (1,3 cm)[6], but is shorter than the ovary of the sheep (1,5 cm)[15] and the goat (*Capra hircus*) (1,5 cm)[4].

The deep recess over the long axis of the foetal springbok ovary on the side attached to the mesovarium, is similar to that of the foetal impala ovary reported by Kayanja[6]. However, this recess is completely absent in the adult ovary of the springbok while it is retained in some ovaries of adult impala as a deep cleft to one side of the ovarian hilus.

During advanced pregnancy the springbok ovary is usually flattened and it is relatively small due to the absence of decreased size of the corpus luteum of pregnancy. The ovarian shape also changes considerably when a large corpus luteum of pregnancy is formed. This is due to the very large size of such a corpus which partially extrudes from the ovary, and has a similar appearance to the corpus luteum of cattle 15 days ovulation[9]. Except for the absence of a central cavity the extrusion and eversion of the springbok corpus luteum is similar to that which Corner found in the rhesus monkey (*Macaca mulatta*)[3]. However, many of the corpora lutea do not protrude from the ovarian surface but they normally give the ovaries a more rounded shape. These corpora usually have a spheroid shape which is similar to the average corpus luteum shape of the white-tailed deer as described by Trauger & Haugen[17]. In contrast to the goat where Harrison[4] found ovulation occurring "mainly at the poles of the ovary", the springbok ovary shows no predilection for site of ovulation.

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BOVINE PARAFILARIASIS: CONDEMNATIONS AT THE CATO RIDGE ABATTOIR

H.G. WALLACE, D.B. WEAVER, P.M. KRETZMANN and J.R. PAYNE*

ABSTRACT: Wallace H.G.; Weaver D.B.; Kretzman P.M. Payne J.R. **Bovine parafilariasis: condemnations at the Cato Ridge abattoir.** *Journal of the South African Veterinary Association* (1983) 54 No. 2, 123-125 (En) Veterinary Division, Department of Agriculture, P.O. Box 206, 3680 Cato Ridge, Natal, Republic of South Africa.

Evidence presented shows a 585 % increase in the compounded total carcase condemnations for parafilariasis at the Cato Ridge abattoir in the year July 1981/June 1982 as compared with July 1979/June 1980. There is also evidence which points to condemnations occurring in bi-annual cycles with peaks in November/December and June.

Key words: cattle, parafilariasis, condemnations.

INTRODUCTION

Infestations of cattle with *Parafilaria bovicola* result in the subcutaneous tissue becoming a greenish-yellow colour, frequently with oedematous, haemorrhagic areas[5], and which, whilst the lesion is active, has a characteristic sharp metallic odour. The odour is quite specific for the condition although it can only be detected a few inches from the affected areas.

In mild cases of the disease – which can be confirmed microscopically by the presence of eosinophils[6] – the discolouration may be found in localised superficial areas anywhere on the carcase, especially the dorsal aspects of the neck, shoulder and thoracic regions. Such lesions can be readily trimmed from the carcases. In severe cases, however, the greenish-yellow discolouration may cover the entire external surface of the carcase, including the limbs[3]. This discolouration may extend into the intermuscular fasciae or, less frequently, into the muscle where occasionally greenish-yellow granulomas up to 10 mm in diameter may be found. Lesions, identified as parafilarial by microscopic demonstration of eosinophils in impression smears, have been found to occur in the subplural, mediastinal and subperitoneal tissues and in the perirenal fat.

Lymph nodes in the vicinity of the active lesions are invariably enlarged and frequently pale and oedematous. The boiling and frying tests of affected meat indicate that the metallic odour is still present after cooking. However, chilling of the carcase decreases the odour which does not appear to return when it is subsequently warmed.

MATERIALS AND METHODS

The Cato Ridge abattoir, built in 1979, is capable of handling 1200 cattle, 5500 sheep and 800 pigs a day and is a mechanically sophisticated establishment situated approximately mid-way between Durban and Pietermaritzburg. The cattle slaughtered there are mainly drawn from Natal, Kwa Zulu, the Eastern Cape and the eastern part of the Orange Free State, many being finished in feedlots situated within Natal and the Eastern Orange Free State.

The Cato Ridge abattoir operates on a mechanical line system where "on line" primary inspection is undertaken by Meat Inspectors who hold a diploma in Public Health. They act as a screen, passing those carcases fit for human consumption, trimming minor or localised pathological lesions and detaining carcases with the more serious or generalised conditions for secondary evaluation by the Veterinary Meat Inspectors.

By far the majority of beef carcases infested with parafilaria will be trimmed "on the line" by the Meat Inspectors. Or those detained, the majority will be trimmed to render them fit for human consumption, whilst a smaller proportion, which are extensively infested, will be condemned.

Occasionally only a portion of the carcase is condemned since each side and even each quarter can be affected to a markedly different degree. In this paper the odd quarter, side or three quarters of a carcase condemned has been included in arriving at the total which is expressed as the number of carcases condemned.

The carcases or portions of carcases which are condemned will be those where trimming is considered as being inadequate to render them marketable. It is these carcases and portions of carcases condemned which this article is intended to cover.

The diagnosis and evaluation of parafilariasis at secondary inspection is made by veterinarians with considerable experience in dealing with the condition. The characteristic nature, colour and odour of the lesion enables an accurate visual diagnosis to be made. To determine the extent of the lesions, muscle groups as well as intermuscular fascia are often excised and examined. The accuracy of the visual diagnosis has frequently been confirmed by the technique advocated by Wellington[6] for the preparation of impression smears and their examination for eosinophils. The parasite itself, is sometimes recovered.

RESULTS AND DISCUSSION

From Table 1 it would appear that extensive infestations have become progressively more prevalent.

Table 1: THE OCCURRENCE AND INCREASE IN TOTAL CARCASE CONDEMNATIONS FOR PARAFILARIASIS

Year	Total Cattle killed	Condemnations		
		Number (Total)	Percentage	Increase %
1979/80	230732	124,5	0,054	–
1980/81	180234	151,75	0,084	56
1981/82	202628	750,5	0,370	585

*Veterinary Division, Department of Agriculture, P.O. Box 206, 3680 Cato Ridge.

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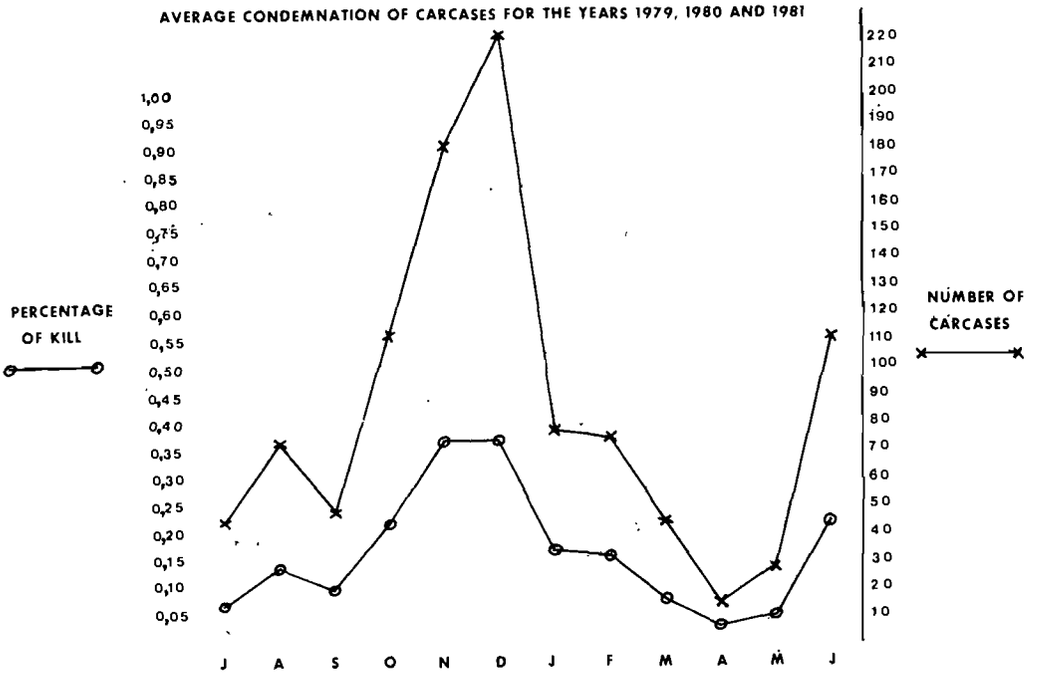

Fig. 1 Average monthly condemnations of carcases for parafilariasis for 1979/80, 1980/81 and 1981/82 at Cato Ridge abattoir

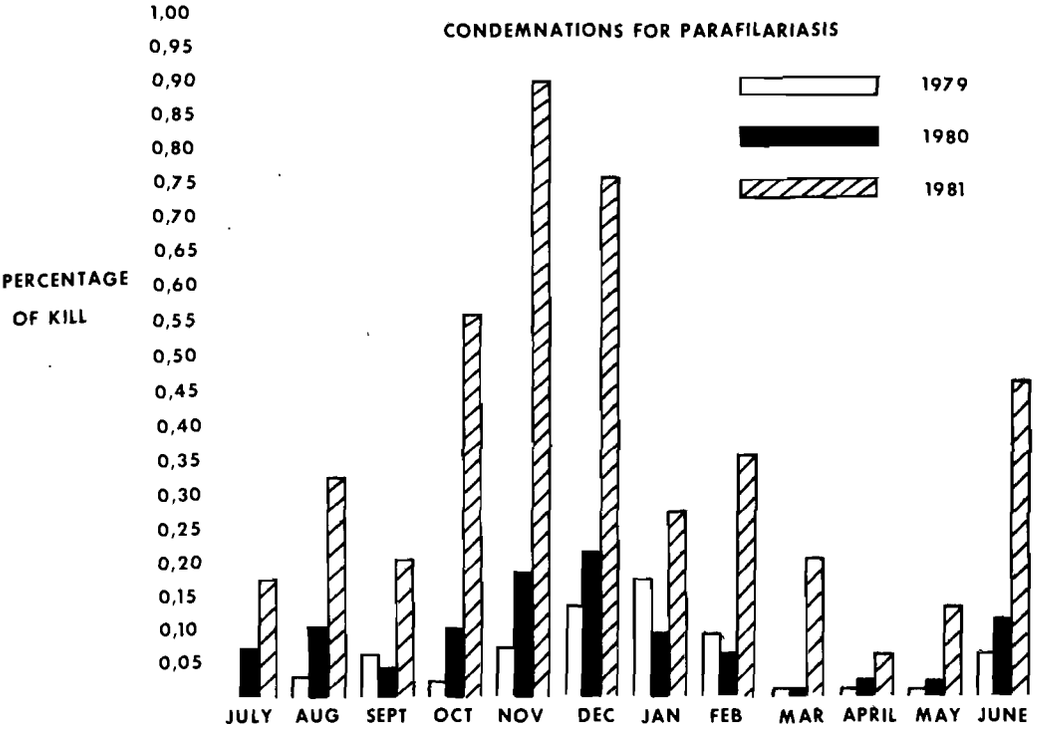

Fig. 2 Monthly total carcase condemnations for parafilariasis for the years 1979/80, 1980/81 and 1981/82 at Cato Ridge abattoir

In Fig. 1 two lines showing actual carcase numbers and carcases condemned as a percentage of the total cattle killed follow a similar pattern and the average for 3 consecutive years appears to indicate bi-annual peaks in November/December and in June. Previous reports referring to work in the Transvaal showed the clinical signs of the disease occurred in annual cycles[4] and that these were associated with the peak activities of the flies responsible for transmission in the summer months[2].

The progressive increase in the condemnations for parafilariasis for the 3 years is clear from Fig. 2, with a marked increase in the final year, 1981/82.

The increase in the rate of condemnations of cattle due to parafilariasis gives cause for serious concern, especially since Cato Ridge abattoir draws most of its cattle from areas which were previously considered as marginal habitat for the known intermediate fly species[1]. The economic importance of the disease as outined by Carmichael & Koster[1] requires further attention with particular reference to the Natal and Eastern Orange Free State regions.

The evidence presented suggests that condemnations for parafilariasis occur throughout the year with peaks in November/December and June and with the main trough in March/April/May. This, however, may not correspond closely to the occurrence of the disease as seen in the field but could be important in relation to treatment.

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BOOK REVIEW — BOEKRESENSIE

MAJOR PROBLEMS IN VETERINARY MEDICINE VOLUME 1 THE PRACTICE OF SMALL ANIMAL ANESTHESIA

DONALD C. SAWYER

1st Edn. The W.B. Saunders Company, Philadelphia 19105. 1982 pp XII and 243, illustrations 61 and tables 20. Price ± R50,00 (ISBN D-7216-7941-2).

Although the series title of this book suggests that it concerns only major problems in the relevant field, the whole field of anaesthesia is comprehensively covered with detailed reference to small animal anaesthesia. The author deals with the information in a stepwise method, from the pre-anaesthetic period, through induction and maintenance to the recovery period. In each of these chapters the relevant problems and possible solutions are discussed. As the subject of anaesthesia can become confusing due to the wide variety of anaesthetics, the author provides a practical guide as to where to use and not to use these drugs.

The first chapter deals with patient evaluation, classification according to physical status and the use of pre-anaesthetic medication. The second chapters deals with the induction period. The most commonly used drugs such as the barbiturates, narcotics, dissociative agents, xylasine and the methods for inhalation induction are discussed. Attention is also given to special techniques such as tracheostomy, intubation by pharyngotomy and the management of an animal with a full stomach. The third chapter describes the general principles of anaesthesia, injectable and inhalation anaesthetics and balanced anaesthesia. Brief attention is also given to epidural anaesthesia as an alternative to high risk patients. The fourth chapter concerns the maintenance of anaesthesia and attention is given to monitoring, intravenous catheterization, fluid therapy and acid-base relationships. The fifth chapter deals with specific problems in anaesthesia and appropriate modifications for specific procedures, young or geriatric patients, pregnancy and disease conditions. The sixth chapter covers anaesthetic procedures in exotic pet animals. The seventh chapter deals with the emergency of cardiac arrest and resuscitation. In the last chapter the recovery period and the effects of the different anaesthetics on recovery are discussed. Complications such as hypotension, cardiac arrhythmias, pneumothorax and aspiration of vomitus are discussed.

This publication will be a definite asset to both student and practitioner and should not just be another book on the shelf collecting dust.

G.F. Stegmann

KORT BERIG **SHORT COMMUNICATION**

MODIFIKASIES VAN 'N GESLOTE SIRKELSTELSEL NARKOSE-APPARAAT VIR GEBRUIK IN HONDE EN KATTE MET LIGGAAMSMASSA MINDER AS 10 kg

G.F. STEGMANN*

ABSTRACT: Stegmann G.F. **Modifications to a closed circle system anaesthetic machine for use in dogs and cats with body mass less than 10 kg.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 127-128 (Afrik) Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

Two modifications are described whereby a closed circle anaesthetic system is converted to a semi-closed anaesthetic system for use in dogs and cats of less than 10 kg body mass.

Key words: Small animal anaesthesia, closed system, semi-closed system.

INLEIDING

Die gebruik van inasemingsnarkose met behulp van 'n geslote sirkelstelsel het alledaagse gebruik geword in die roetine toediening van algemene narkose. Waar die apparaat vir honde en katte met liggaamsmassa minder as 10 kg gebruik word, word asemhaling bemoeilik deur die weerstand wat die natronkalk en eenrigtingkleppe bied teen die vloei van gas. Om die probleem te oorbrug moet die uitgeasemde gas na die atmosfeer vrygelaat word om so 'n semi-geslotestelsel te skep. Vir so 'n stelsel kan o.a. van 'n T-buis of die Magill-apparaat[1] gebruik gemaak word.

MATERIAAL EN METODE

Eenrigtingkleppe word as 'n integrale deel van geslote sirkelstelsels ingebou en die endotrageale buis word met die stelsel verbind d.m.v. 'n Y-verbindingstuk. As alternatief kan die eenrigtingkleppe en Y-verbindingstuk vervang word met 'n aparte eenheid soos die "Ambu"-klep (Ambu Internationaal) wat beide funksies verrig.

Modifikasie 1

Die een been van die geriffelde rubberbuis word direk met die verdamper verbind. Die ander been wat met die natronkalkhouer verbind is, word ontkoppel en oop gelaat na die atmosfeer. Laasgenoemde been moet groot genoeg (kapasiteit) wees om minstens die getyvolume (V_T) van die dier te kan bevat (Fig. 1).

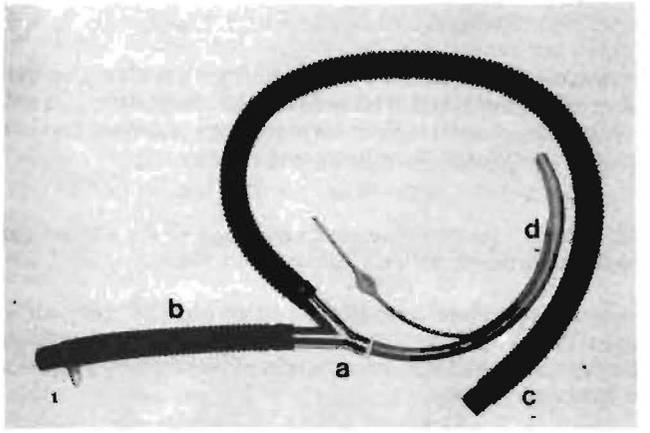

Fig. 1: Y-verbindingstuk (a) met een been (b) oop na die atmosfeer en een been (c) wat aan verdamper gekoppel moet word. Endotrageale buis (d)

Modifikasie 2

Vir narkose-apparaat wat 'n Ambu-klep gebruik, word die geriffelde rubberbuis na die natronkalkhouer ontkoppel by die Ambu-klep en oop gelaat na die atmosfeer. Aan die inasemkant word die sluitklep uit die Ambu-klep verwyder (Fig. 2) en met die verdamper verbind d.m.v. 'n geriffelde rubberbuis (Fig. 3) en 'n reserwesak.

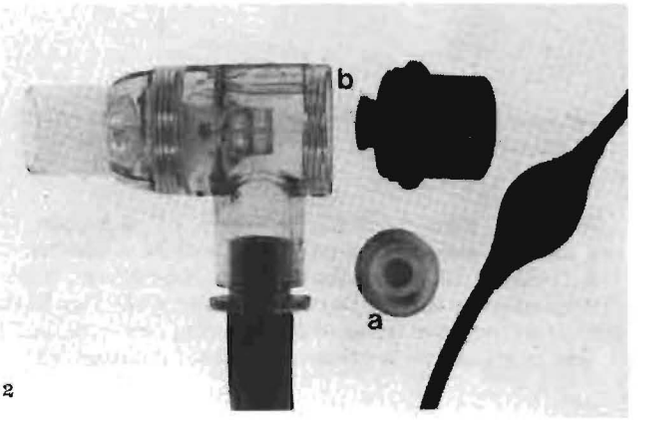

Fig. 2: Ambu-klep (a) aan inasemkant (b) verwyder

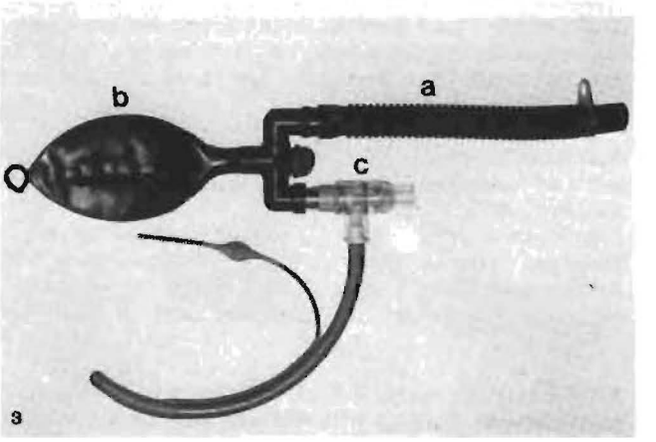

Fig. 3: Geriffelde buis (a) wat met verdamper verbind word. Reserwesak (b) wat met gemodifiseerde Ambu-klep (c) verbind is

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BESPREKING

Uit die aard van die saak kan slegs verdampers wat buite 'n stelsel geleë is bv. 'n "Fluotec" (Cyprane Bpk) vir die semi-geslotestelsel gebruik word.

Die eerste modifikasie stem ooreen met 'n T-buisstelsel en die gasvloei hiervoor benodig is 'n minimum van 2X die minuut volume (VE) van asemhaling[2]. Van 2,5-3 X VE word verkies om herinaseming van gebruikte gasse te voorkom[1]. Die beginsel hier betrokke is om in die periode tussen uit- en inaseming die stelsel skoon te was met vars gas, en hiervoor is 'n hoë gasvloei nodig.

Die tweede modifikasie laat die gebruikte gas direk vry na die atmosfeer, terwyl die uitlaatklep inaseming van kamerlug voorkom. Vars gas word dus vanaf die reserwesak ingeasem. Gasvloei vir die metode moet dus net vervang wat uitgeasem word en dit is VE.

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ABSTRACT: Reinecke, R.K., De Villiers, I.L. & Joubert, Gerda, 1982. **Studies on *Haemonchus contortus*. VIII. Attempts to protect suckling lambs against infestation with *H. contortus*.** *Onderstepoort Journal of Veterinary Research*, **49**, 149-150.

A Group of 12 Merino lambs, 3,5 months of age, which were still suckling, were each dosed with 40 000 infective larvae of *Trichostrongylus axei* on Day 0. From Day +62 – Day 64 each of these lambs and those of a 2nd group of 11 controls were dosed with 30 000 infective larvae of *Haemonchus contortus*, and all the lambs of both groups were killed on Day +90. Attempts to use *T. axei* to protect them against subsequent challenge with *H. contortus* were unsuccessful.

ABSTRACT: Malan, F.S., De Vos, V., Reinecke, R.K. & Pletcher, J.M. 1982. **Studies on *Strongylus asini*. I. Experimental infestation of equines.** *Onderstepoort Journal of Veterinary Research*, **49**, 151-154,

Infective larvae were harvested from a culture of eggs collected from adult *Strongylus asini* recovered from a free-ranging Burchell's zebra, *Equus burchelli*, in the Kruger National Park. Worm-free zebra, horse and donkey foals were successfully infested, but infestation failed in a mule foal. At slaughter, 117-125 days post-infestation, *S. asini* in their 4th moult were recovered from the liver and portal veins. This is the first report of successful experimental infestation of these hosts with *S. asini*.

ABSTRACT: De Vos, A.J., Combrink, M.P. & Bessenger, R., 1982. ***Babesia bigemina* vaccine: Comparison of the efficacy and safety of Australian and South African strains under experimental conditions in South Africa.** *Onderstepoort Journal of Veterinary Research*, **49**, 155-158.

A *Babesia bigemina* vaccine strain (G strain) of reduced virulence was obtained from Australia and tested experimentally for efficacy and virulence. The strain caused mild reactions in 10 animals and afforded good protection to challenge with a virulent South African strain. The virulence of the local vaccine strain was not noticeably reduced after 3 slow passages in intact calves and it was consequently replaced by the Australian strain in the Onderstepoort babesiosis vaccine.

ABSTRACT: Reinecke, R.K., De Villiers, I.L. & Joubert, Gerda, 1982. **The effect of predosing calves with *Trichostrongylus axei* on subsequent challenge with *Haemonchus placei*.** *Onderstepoort Journal of Veterinary Research*, **49**, 159-161.

Twelve calves were dosed with 40 000 and a further 12 with 80 000 infective larvae of *Trichostrongylus axei* respectively. These 2 groups and a control group were subsequently dosed with 50 000 infective larvae of *Haemonchus placei*. Predosing with *T. axei* had no effect on the establishment of *H. placei*. It is postulated that the numbers of *T. axei* worms present were below the 'threshold' value necessary to protect the calves against challenge with *H. placei*.

SHORT COMMUNICATION **KORT BERIG**

OSTEOCHONDRODYSPLASIA IN A LITTER OF BULLDOG PUPPIES

G.J. LOUW*

ABSTRACT: Louw G.J. **Osteochondrodysplasia in a litter of Bulldog puppies.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 129-131 (En) Department of Anatomy, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

A 1-month-old male Bulldog pup was presented with severe dyspnoea and was also unable to stand. Radiographs revealed a considerable dorsoventral flattening of the thoracic cavity, resulting in a reduced intrathoracic volume. The scapula of each foreleg was malpositioned on the thorax, resulting in the inability to adduct the legs and carry the body weight. The clinical signs are typical of an animal suffering from osteochondrodysplasia.

Key words: Osteochondrodysplasia, Bulldog, dyspnoea.

INTRODUCTION

Sporadic cases in the dog of developmental defects to the skeletal system have been reported. The correct classification of these defects can be made only by conducting extensive radiographic and histopathological investigations, and by then comparing the findings with the international nomenclature for constitutional diseases producing skeletal deformities in man[1].

HISTORY

There were 7 pups in the first litter produced by a 2-year-old Bulldog bitch and all were suffering from various developmental defects. The first 4 pups born were dead and were not available for examination. The owner stated that these pups showed abnormally bent vertebral columns. Three pups were born alive, of which one suffered from a cleft palate and was killed. The remainng 2 pups both showed dyspnoea and were unable to walk.

CLINICAL AND PATHOLOGICAL FINDINGS

The 1-month-old male pup presented for examination was well-nourished, weighed 1 kg, and had a favourable habitus. The obvious clinical sign was a gasping dyspnoea, during which the walls of the thorax barely moved, yet abdominal respiration was vigorous. The mucous membranes were fairly cyanotic. When the pup was laid on his back, he was unable to right himself. Examination of the animal from the abdominal side revealed considerable dorsoventral flattening of the thorax (Fig. 1) and during inspiration, the sternum became markedly concave.

On examination of the locomotor system of the pup it was noted that he was unable to walk, but lay spread-eagled on the floor (Fig. 2). Palpation of the scapulae of the forelegs showed that they were displaced dorsally on the thorax and therefore the pup was unable to adduct the legs and bear weight. The constant recumbency had led to an abnormal angle of the bones of all 4 limbs, atrophic musculature and dorsoventral flattening of the thoracic cavity because of the constant weight on the sternum (Fig. 3).

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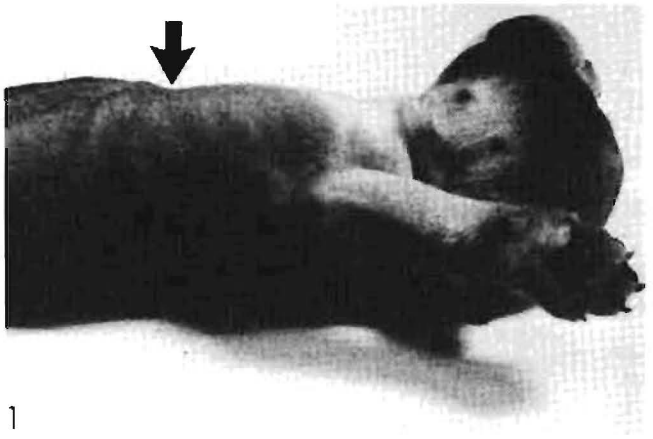

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Fig. 1: The pup in dorsal recumbency. Note the dorsoventral flattening of the thorax, and the concave sternum (arrowed) during inspiration.

2

Fig. 2: The pup lying spread-eagled.

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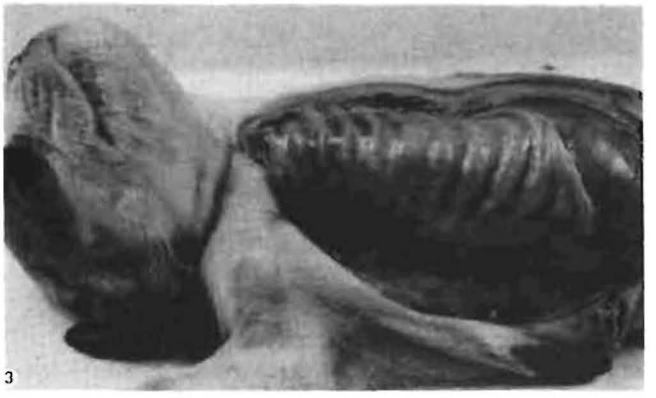

Fig. 3: A lateral view at necropsy before the thoracic cavity was opened. Note the concave sternum.

Fig. 4: A lateral radiograph of the pup showing the heart occupying most of the middle and cranial parts of the thoracic cavity.

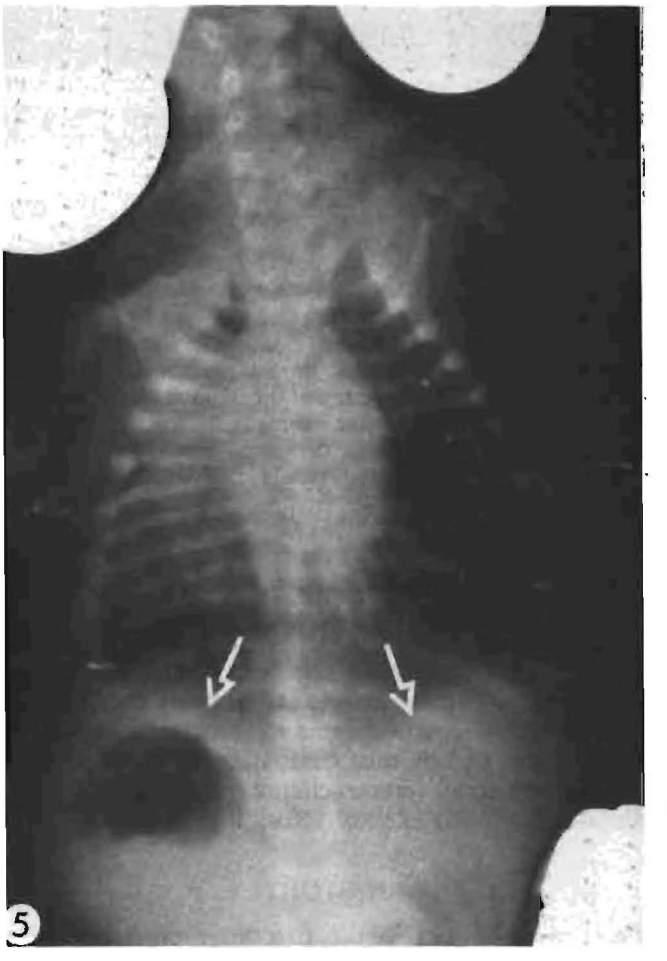

Fig. 5: A dorsoventral radiograph of the pup, during inspiration. Note the diaphragmatic line (arrowed) and the caudal positioning of the lungs.

Radiographs were taken of the pup. The lateral radiographs (Fig. 4) demonstrated a dorsoventral flattening of the thoracic cavity, so that the heart was in contact with the thoracic vertebral bodies and the sternum. Both dorsal and lateral radiographs (Fig. 4 & 5) showed that the majority of the lung lobes were forced caudally because of the lessened volume within the thoracic cavity.

The pup was then euthanased, and at necropsy both lungs were found to occupy only 2 'tunnels' within the thoratic cavity, extending laterally along the heart and dorsocaudally alongside the crurae of the diaphragm (Fig. 6).

DISCUSSION

Many of the cases of osteochondrodysplasia in man are inherited conditions[1,2]. The causative agent in these cases is an autosomal ressessive gene. If the case report of Riser & Jezyk[2] is extrapolated from the Miniature Poodle breed to this Bulldog litter, then it is possible that the cause could have been an autosomal ressessive inheritance. Yet the entire litter was affected by developmental defects in the skeletal system. The genetic chances of all 7 pups in a litter suffering from an inherited defect are very slight. Therefore it can be proposed that there was a teratogen present in the environment during the gestation period. Although mammals are usually spared the deleterious effects of extrinsic

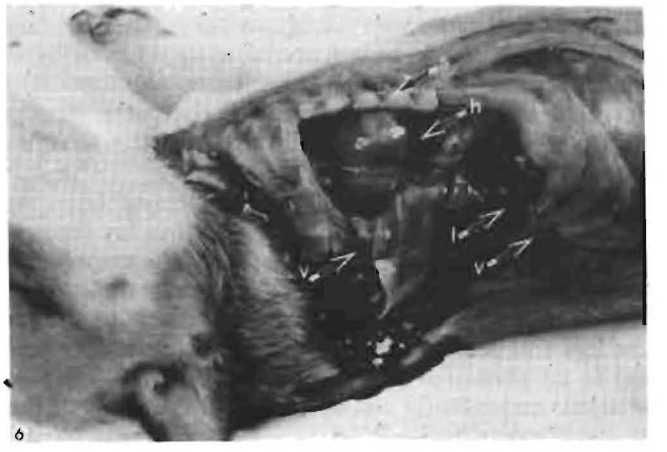

Fig. 6: The opened thoracic cavity demonstrated that the heart (h) was in contact with the sternum ventrally (s) and the vertebral bodies dorsally (v). The lobes of the lung (l) were all forced into the 'tunnel' caudodorsally.

factors during gestation because the developing foetuses are well protected by the uterus and placental membranes, numerous teratogens are known. Examples of these are trauma, irradiation, variations in environmental temperature, reduced oxygen availablity to the foetus, exposure to chemical substances, nutritional deficiencies during the gestation period, advancing age of the mother, and systemic diseases of the mother or localised infections of the uterus[3].

Communication with the owners of the Bulldog bitch revealed no knowledge of exposure of her to chemical substances nor any history of ailments during her gestation period. A fairly simple method of determining whether an inherited condition is being dealt with would be by allowing the bitch to be mated again with the dog, and to examine the litter that follows for any similar deformities to the skeletal system.

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MOBILE SHEEP PEN SAVES TIME AND LABOUR

Up to 80 ewes can be accommodated in a mobile sheep pen from Britain that can be erected in a variety of permutations to provide a catching pen, holding pen and foot bath. Fitted with three-point linkage for tractor mounting, it is also available with bogie and wheels for towing by van or four-wheel drive vehicle.

The standard all-purpose Farmer pen is made up of a 2,44 m wide x 1 m high race, ten 1,22 m wide x 1 m high gates and two additional gates 2,44 m and 600 mm wide x 1 m high respectively, forming an enclosure of 15 m^2. The race can also be separated from the gates and used as a tractor-mounted transporter for carrying up to ten ewes.

Ruggedly constructed from heavy gauge steel tube, the pen is nevertheless relatively light, weighing approximately 300 kg. By dispensing with the conventional time consuming process of manhandling hurdles on and off trailers, hinging them together and staking, it can be easily erected by one man.

Additional gates and a 3 m long race can also be supplied.

(R L Farmer Ltd, New Farm Engineering, Crooke Tree Lane, Hatfield, Doncaster DN7 6EW, Yorkshire, England. Telephone: Thorne (0405) 812218) (LPS)

CLINICAL COMMUNICATION KLINIESE BERIG

MUSCULAR WEAKNESS IN A DOG ASSOCIATED WITH SEVERE ROUNDWORM INFESTATION

J. VAN HEERDEN*

ABSTRACT: Van Heerden J. **Muscular weakness in a dog associated with severe roundworm infestation.** *Journal of the South African Veterinary Association* (1983) 54 No. 2, 133-134 (En) Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 Medunsa, Republic of South Africa.

Clinical signs of muscular weakness which were not due to hypocalcaemia or hypoglycaemia were seen in a pup with a severe infestation with roundworms.

Key words: Incoordination, muscular weakness, dog, roundworms.

INTRODUCTION

Convulsions have been described in puppies with severe roundworm infestations[1,3]. It does not appear as if the exact cause of this nervous derangement has been established and various possible pathophysiological mechanisms have been proposed such as a low blood calcium level, hypoglycaemia, neurotoxins, local irritation and reflex stimulation. It is not stated where the "local irritation" and "reflex stimulation" occurs. If toxins are involved they may be substances secreted by the nematodes or simply be compounds released by disintegrating parasites.

According to Chrisman[1] severe infestation with parasites and an inadequate diet are common causes of hypoglycaemia in puppies. It is therefore regarded as the most common metabolic cause of seizures in puppies. In between seizures puppies may be weak and depressed. Anaemia and hypocalcaemia may further compound the problem.

Hypoglycaemia associated with heavy internal parasite infestation has also been described in physically-mature toy breeds (Poodles and Maltese Poodles) under the age of 2 years[1]. According to Chrisman[1] these animals are unable to store adequate glycogen reserves in the liver and "have no resources during times of stress".

Nervous signs in pups may also be due to aberrant migration of larvae into the brain[2].

Over a period of approximately 6 years, 3 litters have been seen by the author in which all the pups exhibited signs of muscular weakness. The clinical signs resembled those of myasthenia gravis except for the fact that they did not disappear following a period of rest. In all instances, the clinical signs were associated with a severe infestation of the roundworm, *Toxocara canis*. In general the pups responded favourably to anthelmintic treatment and recovered uneventfully. This report deals with such a syndrome in a puppy.

CASE REPORT AND DISCUSSION

Recently, a Pomeranian-type puppy, approximately 6 weeks old, was presented with clinical signs of severe incoordination and an inability to stand or walk. It whined continually. All the reflexes were intact. The stools were black.

A faecal flotation test revealed the presence of numerous eggs of *Ancylostoma caninum* and *T. canis*. A blood chemical analysis showed the following:

Total serum proteins	:	35 g/ℓ
S-Albumin	:	14,9 g/ℓ
S-Globulins	:	20,3 g/ℓ
P-Glucose	:	4,6 m mol/ℓ
S-Sodium	:	138,9 m mol/ℓ
S-Potassium	:	6,32 m mol/ℓ
S-Calcium (total)	:	2,42 m mol/ℓ
S-Magnesium	:	0,96 m mol/ℓ

Because the clinical signs resembled myasthenia gravis, a subcutaneous injection of 0,3 mg neostigmine sulphate was administered but this did not result in any clinical improvement.

A diagnosis of verminosis was made which was based on the results of the faecal analysis. This diagnosis was supported by the low serum albumin values. The pup was subsequently treated simultaneously with Lopatol, (Ciba-Geigy) and disophenol (Ancylol, S A Cyanamid) at the recommended dosage levels. It received no other treatment, and made a slow but progressive and complete recovery over the next 6 days.

Based on the chemical pathology, it seems unlikely that the clinical signs shown by the pup were caused by hypoglycaemia and/or hypocalcaemia.

According to Levine[2] parasites may injure their hosts in many ways, including a) the production of toxic substances such as haemolysins, histolysins and anticoagulants and b) they may cause allergic reactions. This statement is vague but it possibly reflects the present incomplete knowledge of many host-parasite interactions.

The extensive migration of certain parasites through the tissues of the host during their histotrophic phase may well trigger off extensive defence mechanisms by the host which results in the death of parasites and subsequent release of numerous toxic breakdown products. The release of such substances as acetylcholinesterases[4] with consequent interference in neuromuscular transmission is a theoretical possibility. However, such deleterious substances probably only result in the manifestation of detectable clinical signs by the host if present in large quantities, as can be expected when massive infestations are present.

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The syndrome of muscular weakness in puppies suffering from severe roundworm infestation presented here is described with complete awareness of the fact that general debility, emaciation and anaemia are commonly encountered in puppies with severe parasite infestations.

The clinical syndrome could easily be misdiagnosed as canine distemper or a cerebellar lesion because of the severe ataxia. A routine investigation for parasite infestation should be performed in puppies exhibiting nervous signs.

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ABSTRACT: Thomas, Shan E., Wilson, D.E. & Mason, T.E., 1982. **_Babesia, Theileria_ and _Anaplasma_ spp. infecting sable antelope, _Hippotragus niger_ (Harris, 1838), in southern Africa.** *Onderstepoort Journal of Veterinary Research*, **49**, 163-166.

Some observations are recorded on blood parasites of sable antelopes. Blood smears of 124 of these antelopes from South Africa and Zimbabwe were examined and 7 were found to be positive for a *Babesia* sp., identified as *Babesia irvinesmithi* Martinaglia 1936. A total of 70 of the smears were positive for theilerial piroplasms, while 1 smear had macroschizonts (with cytomeres) and microschizonts of a *Theileria* (= *Cytauxzoon*) sp. One blood smear was positive for an *Anaplasma* sp.

Attempts to isolate the *Babesia* sp. by subinoculating blood from sable to splenectomized and intact sable and splenectomized cattle were unsuccessful. Attempts to infect sable with *Babasia bovis* and *Babesia bigemina* were likewise unsuccessful. Theilerial piroplasms reached high levels in a splenectomized sable but could not be transmitted with blood to cattle. The *Anaplasma* sp. was found to be infective for sheep but not for cattle.

ABSTRACT: Cameron, C.M., 1982. **Antibody response of guinea-pigs and cattle to a _Campylobacter fetus_, oil emulsion vaccine.** *Onderstepoort Journal of Veterinary Research*, **49**, 177-179.

A method is described for the mass production of *Campylobacter fetus* oil emulsion vaccine, using 2 strains of *C. fetus* ss *intestinalis* and a strain of *C. fetus* ss *intermedius* as a substitute for *C. fetus* ss *venerialis*. Heifers, given 2 injections of the vaccine, developed serum antibody titres comparable with the response induced by a commercial product.

ABSTRACT: Spencer, K.C. & Seigler, D.S., 1982. **Tetraphylin B and _epi_-tetraphylin B from _Adenia glauca_ Schinz.** *Onderstepoort Journal of Veterinary Research*, **49**, 137-138.

Tetraphyllin B and *epi*-tetraphyllin B have been isolated from the South African plant *Adenia glauca* Schinz in an approximate ratio of 5:1.

The structures were established by ^{1}H-NMR.

ABSTRACT: De Vos, A.J., Bessenger, R. & Fourie, C.G., 1982. **Virulence and heterologous strain immunity of South African and Australian _Babesia bovis_ strains with reduced pathogenicity.** *Onderstepoort Journal of Veterinary Research*, **49**, 133-136.

A South African *Babesia bovis* strain showed loss of virulence after 10 rapid passages in splenectomized calves. The virulence was comparable with that of an attenuated Australian vaccine strain. Vaccination of crossbred *Bos indicus* cattle with the local strain resulted in a solid immunity to heterologous challenge. The degree of protection afforded by the Australian vaccine strain was adequate for controlling challenge with a virulent South African strain, but somewhat less than the degree conferred by the local vaccine strain. Serological observations with the indirect fluorescent antibody test confirmed a close relationship between the 2 modified strains.

ABSTRACT: Horak, I.G., Brown, Moira R., Boomker J., De Vos, V. & Van Zyl, Elsa A., 1982. **Helminth and arthropod parasites of blesbok, _Damaliscus dorcas phillipsi_, and of bontebok, _Damaliscus dorcas dorcas_.** *Onderstepoort Journal of Veterinary Research*, **49**, 139-146.

The helminth burdens of 8 blesbok shot in the north-eastern Orange Free State, 8 from the eastern Cape Province, 28 from the eastern Transvaal and 3 from the central Transvaal were determined. In addition, the arthropod burdens of 11 of these animals were ascertained. Twenty-one nematode species, 2 cestode species, 6 ixodid ticks, 2 lice and the larvae of 5 oestrid flies were recovered. Three of the nematode species, 2 of the oestrid flies and 4 of the tick species had apparently not previously been recovered from blesbok.

Thirty-one bontebok culled in the south-western Cape Province were examined for endoparasites and 8 of these animals were also examined for ectoparasites. They harboured 12 nematode species, 3 ixodid ticks, a louse and the larvae of an oestrid fly. In common with some of the blesbok they were parasitized by *Dictyocaulus magnus*, *Longistrongylus curvispiculum*, *Trichostrongylus axei*, *Nematodirus spathiger* and the larvae of a large *Gedoelstia* sp. Five of the nematode species, the larvae of the oestrid fly species and the 3 ixodid tick species had not previously been recorded from bontebok.

ABSTRACT: Horak, I.G., De Vos, V. & De Klerk, B.D., 1982. **Helminth and arthropod parasites of vaal ribbok, _Pelea capreolus_, in the western Cape Province.** *Onderstepoort Journal of Veterinary Research*, **49**, 147-148.

Five vaal ribbok, culled in the Bontebok National Park during December 1979, were examined for helminth and arthropod parasites. Ten nematode species, a louse and 2 tick species were recoved and there was also evidence of previous infestation by the larvae of 2 oestrid flies. The parasite burdens of the vaal ribbok are compared with those of sympatric bontebok and springbok culled at the same time.

CASE REPORT **GEVALVERSLAG**

THE USE OF CORTICOSTEROIDS IN A DOG WITH MYASTHENIA GRAVIS

J. VAN HEERDEN* and SELMA J. VAN SCHOUWENBURG**

ABSTRACT: Van Heerden J.; Van Schouwenburg S.J. **The use of corticosteroids in a dog with myasthenia gravis.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 135-137 (En) Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 Medunsa, Republic of South Africa.

A diagnosis of myasthenia gravis was made in an approximately 3-year-old mongrel bitch based on physical, radiographic and electromyographic findings as well as on the response of the patient to an anticholinesterase drug. The patient responded favourably to parenteral treatment with an anticholinesterase drug but did not respond to oral administration of the drug. When the drug was given orally in combination with corticosteroids it had a long-lasting and favourable effect on the patient.

Key words: myasthenia gravis, dog, corticosteroids.

INTRODUCTION

Myasthenia gravis is a neuromuscular disorder characterized by weakness of voluntary muscles and intolerance to exercise[2 3]. The clinical signs of the condition in man and the dog as well as the diagnosis thereof have been well recorded in the literature[3 4 9 10 11]. Acquired and congenital forms of the disease have been described. Although an exact explanation for the muscular dysfunction has not been clearly established, antibodies binding with cholinergic receptors on the post-synaptic membranes have been identified in myasthenic patients suffering from the acquired form of myasthenia gravis. It has been postulated that antibodies to the acetylcholine receptors might be responsible for decreasing available receptor sites either by blocking the site, by causing increased breakdown of receptors or by causing decreased synthesis of receptors. Not only antibody mediated responses but cell mediated responses might also be involved in the pathogenesis of the disease. Acquired myasthenia gravis is thus presently regarded as a systemic auto-immune disorder of acetylcholine receptors resulting in a receptor deficit[2].

The congenital form of myasthenia gravis should be differentiated from the acquired form in that there is usually no evidence of circulating antibodies to acetylcholine receptors[5 11]. In the congenital form antibody-acetylcholine receptor complexes are usually absent from the neuromuscular endplates and there is a deficiency of acetylcholine receptors in the postsynaptic membrane[7 10].

Therapy of myasthenia gravis is usually aimed at increasing the chances of acetylcholine receptor to combine with acetylcholine. Choline-esterase inhibitors are most commonly used to achieve this effect. Corticosteroids, immunosuppresive drugs and plasmapheresis are also nowadays included in a medical treatment plan because of the involvement of the immune system in the disease. In general, a thymectomy is indicated in human patients whenever myasthenia gravis is associated with a thymoma[3 4].

The disease, although more common in man, has also been described in the dog by a number of authors[1 4 6 12]. At least 4 cases have been reported in the cat[5 8].

This report presents a case of myasthenia gravis in a dog. The treatment carried out, however, differed somewhat from that which has been reported for most canine patients to date.

CLINICAL SIGNS, DIAGNOSIS AND TREATMENT

An approximately 3-year-old Doberman-cross bitch with a body mass of 29 kg was presented with a history of general weakness which improved after a period of rest. The owner had obtained the dog from an animal welfare society approximately 8 months before it was presented for examination. The animal had been showing signs of periodic weakness for the last 6 weeks.

On physical examination the patient was found to be quiet and somewhat depressed. It could only be induced to walk for about 5 m before it showed signs of severe muscle weakness, reluctance to move, sagging of hindquarters which progressed to semi-crouching, and crouching with the dog eventually lying down in sternal recumbency. Deep palpation of the musculature did not reveal any pain. The above-mentioned clinical signs disappeared with rest but were easily precipitated by exercise. During the physical examination the animal was observed to vomit.

A dose of 0,54 ml of neostigmine (Neostigmine methylsulphate, Centaur Labs) administered subcutaneously caused complete disappearance of symptoms within 3 minutes. The animal was able to run and jump without any difficulties. The ability to move normally was retained for at least 6 hours.

This test procedure was repeated the following day with the same dose of neostigmine. A good response was observed one minute after the injection.

Radiological examination of the chest revealed severe megalo-oesophagus.

Assay results of serum sodium, calcium, potassium, phosphorus and magnesium concentrations were within normal limits. Creatine kinase, aspartate transaminase, serum creatinine and serum urea levels were also within the normal range.

An ECG taken showed prominent Q-waves in Leads I and II as well as relatively deep S waves in Lead III. The Sabin-Feldman test for the detection of antibodies against *Toxoplasma gondii* yielded negative results.

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Muscle action potentials were recorded with the aid of a Dynamic Electronics Electrophysiological Teaching Unit (Fig. 1). These action potentials were compared with those from a normal control dog. Both dogs were anaesthetized with thiopentone sodium. The patient showed a decline in action potential with repeated stimulation of the muscle (Fig. 2).

The response of the patient to neostigmine, the results of electromyographic studies and radiological examination were taken as being confirmative for myasthenia gravis. The owner then requested euthanasia but gave permission for experimental treatment.

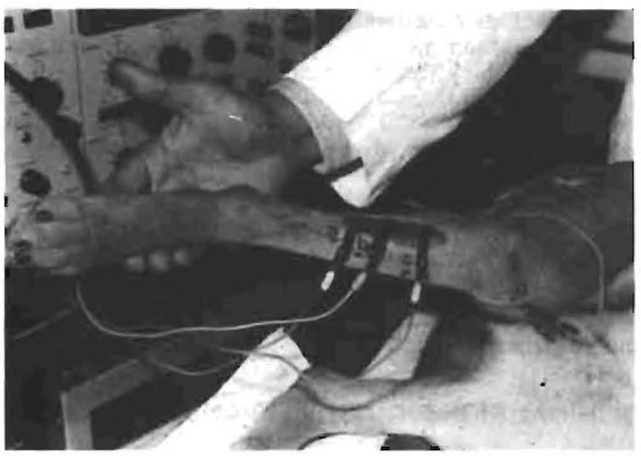

Fig. 1: Dog under general anaesthesia demonstrating the positioning of the electrodes. a, positive recording electrode; b, negative recording electrode; c, earth; d, stimulator; e, anode of stimulator.

The patient was hospitalised and treated as set out below. Vomition was observed frequently during the period of hospitalisation.

DAY	TREATMENT	RESPONSE
1-11	15 mg neostigmine (prostigmin, Roche) twice daily per os.	Slight improvement. Dog could walk approximately 30 m before clinical signs of muscle weakness reappeared
12	1,35 mg neostigmine (Neostigmine methylsulphate, Centaur Labs) subcutaneously. This dosage was repeated 6½ min later.	Initial injection had no effect within 6½ min. Three min after the second injection the patient was walking and running normally.
13-23	22,5 mg neostigmine 3 times daily per os	No improvement. Dog became paretic very soon after the onset of excercise.
24	1,75 mg neostigmine subcutaneously.	Complete remission of clinical signs for 3 h.
25-32	30 mg neostigmine 3 times daily per os; 100 mg of prednisolone (Delta Cortril, Pfizer) intramuscularly once daily.	Within 24 h the dog was walking and running normally. It stayed normal for the rest of this period.

The dog died suddenly during the night of Day 32. A post-mortem investigation showed that the cause of death was canine babesiosis and confirmed the presence of megalo-oesophagus as well as slight right ventricular dilatation.

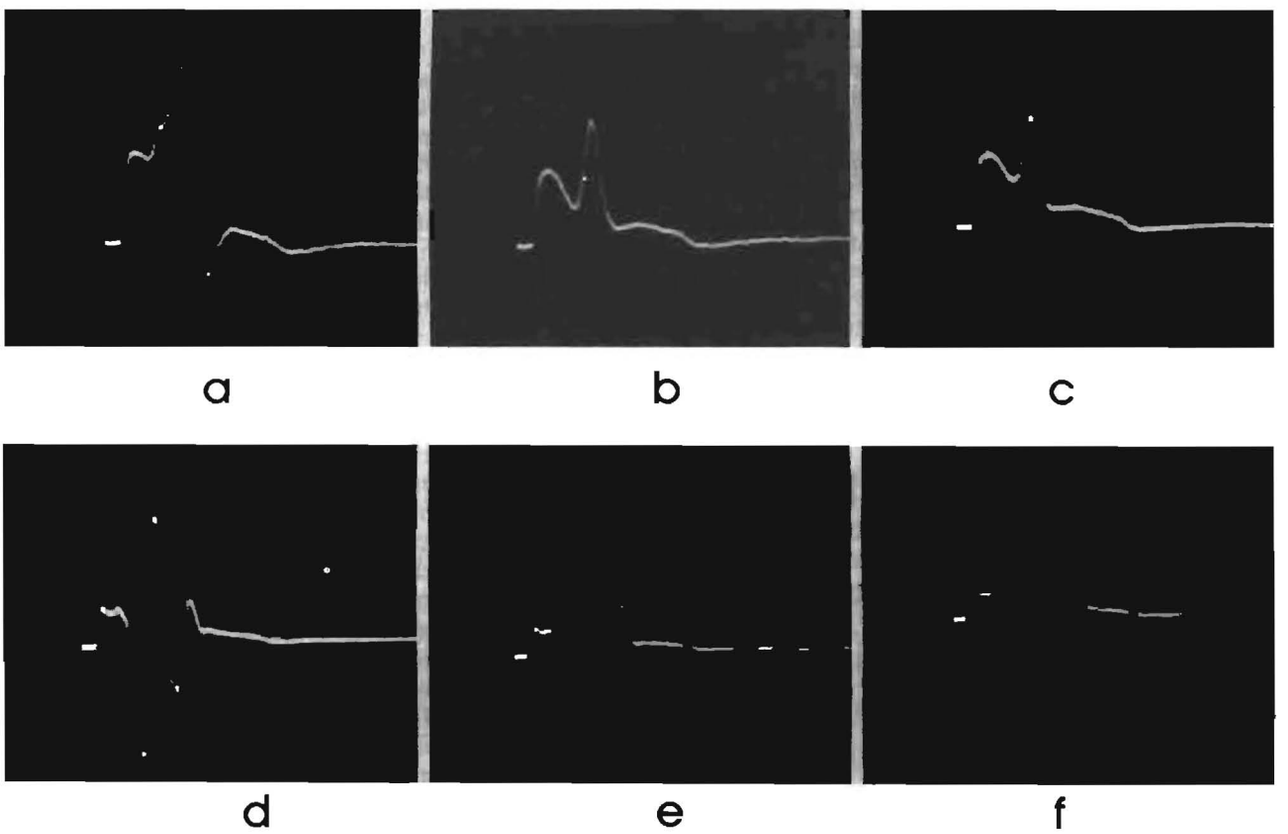

Fig. 2: Muscle action potentials of patient after a period or rest a, and after 1 minute b, and 2 minutes c, of stimulation. Action potentials obtained from control dog "at rest" d, and after 1 min e, and 2 min f, of electrical stimulation F5 V 100 S 500 μV/cm

DISCUSSION

In the presented case, the oral administration of a cholinesterase inhibitor alone was not successful. The absorption was probably poor or erratic due to the fact that the animal suffered from megalo-oesophagus which resulted in the vomition that was observed frequently during the period of treatment. The parenteral administration of neostigmine on the other hand was effective in causing complete remission of clinical signs. It is to be noted, however, that as the condition progressed, parenteral neostigmine administration took longer to take effect and was of shorter duration.

The last 8 days of treatment involved the use of an oral anti-cholinesterase in combination with parenteral corticosteroids. Although the dose of neostigmine was slightly higher (30 mg 3 times a day) than that given previously (22,5 mg 3 times a day) the good response observed in the patient can probably be ascribed to the effect of the corticosteroids because vomition was still observed during this period probably resulting in erratic absorption from the gastrointestinal tract.

The simultaneous administration of anticholinesterases and steroids reportedly exacerbate the syndrome in the dog[1 12]. Corticosteroids have, however, been proved to be effective in the treatment of myasthenia gravis in man[3 4]. Drachman[3] proposed that steroid treatment should be considered in any human "myasthaenic patient" where weakness was not satisfactorily controlled by anticholinesterase medication or thymectomy. His method involves and optimal dose of anticholinesterase drugs in combination with corticosteroids which are gradually increased until an optimal response is obtained or, as tolerated by the patient, with a maximum daily dosage of about 50-60 mg of prednisolone. A minimal maintenance dosage of corticosteroids should be established with a simultaneous decrease in anticholinesterase dosage.

In the presented case the dosage of corticosteroids was probably unnecessarily high and maintained for an unnecessary long period of time. The initial high dosage of corticosteroids should have been tapered down according to the response of the patient. Breton et al.[1] treated a dog successfully with prednisolone at a dosage rate of 2 mg/kg every second day in combination with neostigmine. Prolonged steroid therapy in patients with myasthenia gravis has the same side effects as prolonged steroid therapy in general[4]. Owners of pets on corticosteroid therapy should be made aware of the possible side effects of long-term therapy. The sudden death of the patient as result of a *Babesia canis* infection could possibly be ascribed to reduced resistance of the patient due to the very high doses of corticosteroids.

ACKNOWLEDGEMENTS

The authors are indebted to Prof. H J Bertschinger for the photographs and E M G studies and to Mrs Kathryn Aronson for the translation of a French article.

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CASE REPORT **GEVALVERSLAG**

POISONING IN CATTLE HAND SPRAYED WITH AN ARSENICAL DIP

JEAN BRADLEY*

ABSTRACT: Bradley J. **Poisoning in cattle hand sprayed with an arsenical dip.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 138 (En) Veterinary Diagnostic Laboratory, Private Bag 0035, Gaborone, Republic of Botswana.

Deaths occurred in cattle from poisoning after hand-spraying with arsenical dip used at incorrect concentration. Treatment with sodium thiosuphate was delayed, but partly successful.

Key words: Arsenical poisoning, cattle, dip, sodium thiosulphate.

CASE HISTORY

After being hand-dressed with an arsenic acaricide preparation, 5 cattle died, and specimens were sent to the Veterinary Diagnostic Laboratory in Gaborone. The cattle in this herd were pedigree Simmentalers, whose owner had always in the past sprayed his animals with tick dip himself. On this occasion, he left no instructions with his labourers that the cattle should be sprayed, but in his absence, the stockman decided to do the job by himself. It appears that an arbitrary amount of dip concentrate was mixed with water, and liberally applied. In view of the history, the samples were examined for the arsenic content. The presence of the element was established in stomach contents, liver and kidney.

The following morning 15 more animals had died, and a Veterinary Officer from the laboratory visited the cattle post to assist with treatment. By the time the Veterinary Officer arrived, a total of 22 animals had died, out of a herd of 85, most of the fatalities being pregnant cows, or cows with calves. Twenty-four other animals were still showing signs of clinical poisoning, in varying degrees of severity. The worst affected were salivating profusely, moving with a staggering gait, and had areas of burnt and peeling skin where the dip had been applied most heavily. Some of the less affected animals had started to graze again.

TREATMENT

The local staff had already carried out suitable first aid treatment, in the form of copious washing of the sprayed animals, and drenching with large quantities of normal saline solution. The Veterinary Officer administered sodium thiosulphate to all the remaining cattle in the sprayed group, at the rate of 20 g per animal, dissolved in 120 ml distilled water, and injected intravenously. Enough of this solution was left with the owner to give an equal dose, by mouth, the next day. He was told where he could obtain more of the chemical, but it is not known if he did, in fact, give further treatment, although it was later reported that the animals still showing severe clinical signs of poisoning at the time of the visit died within the next few days.

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DISCUSSION

The dip was identified as Tixol (Coopers) which the makers recommend to be used at a concentration of 0.16% As_2O_3. The specimen of dip as used contained 5,4% As_2O_3. Table 1 shows the comparison between the average amount of arsenic which may be expected in animals dipped regularly in an arsenical dip and the average lethal dose according to Garner as well as the amounts contained in the tested samples. These results confirm the diagnosis of arsenic poisoning.

Table 1: NORMAL, AVERAGE LETHAL AND TESTED ARSENIC LEVELS

	Normal level of As in dipped cattle	Average lethal dose	Concentration in tested sample
Liver	1.25 ppm	40 ppm	150 ppm
Kidney	1.16 ppm	34 ppm	120 ppm (1) 68 ppm (2)

Although the local veterinary staff responded quickly to the call for help, turning out on a Sunday to carry out a post-mortem examination, and give their first aid, this was 2 whole days after the incorrect use of the dip. The delays were inevitable, as first the stockman had to summon the owner after the signs of illness were seen, then he had to contact the Veterinary Office, whose members immediately attended to the outbreak but could not send specimens to Gaborone until Monday, and the antidote was not available until Tuesday.

One is left wondering if these animals could have been saved by immediate treatment, or if some were bound to die, after the application of such an over-strong arsenical dip.

A case such as this is a reminder that dangerous chemicals should be kept locked up. This, however, is the first recorded case of arsenic poisoning in Botswana.

ACKNOWLEDGEMENTS

We are grateful to the Toxicology Department of the Veterinary Research Institute, Onderstepoort, for the arsenic estimations they carried out.

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CONTINUED EDUCATION — VOORTGESETTE OPLEIDING

PRAKTIESE ELEKTROKARDIOGRAFIE. I. VOLLEDIGE HARTBLOK IN 'N HOND

J. VAN HEERDEN*

ABSTRACT: Van Heerden **J. Practical electrocardiography. I. Complete heart block in a dog.** *Journal of the South African Veterinary Association* (1983) **54** No. 2, 139-140 (Afrik) Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 Medunsa, Republic of South Africa.

The clinical signs, electrocardiographic diagnosis and treatment of complete heart block in an 11 year old Chow dog are discussed.

Key words: Electrocardiography, complete heart block, dog.

GEVALVERSLAG

'n Elf-jaar oue Chow teef is opgeneem met 'n geskiedenis van skielike aanvalle van stuiptrekkings sedert die vorige dag.

Die belangrikste bevindings met die kliniese ondersoek het ingesluit depressie, swakheid, matige asemnood en 'n opvallende aritmie van die hart. Tydens die ondersoek het die pasiënt ineengestort, matige rukbewegings van die kop en speekselvloei getoon. Gedurende hierdie periode van ineenstorting wat ongeveer 12 sekondes geduur het, kon geen hartklanke met die stetoskoop gehoor word nie.

Op hierdie stadium van die ondersoek is die probleme kortliks as volg gelys: Bradi-aritmie, periodieke floutes, algemene swakheid en matige asemnood. Die verdere ondersoek van die bradi-aritmie is as hoogste prioriteit gestel en 'n elektrokardiogram is onmiddellik van die pasiënt geneem (Fig. 1).

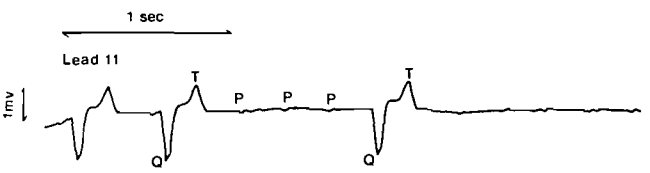

Fig. 1: Volledige hartblok. P-golwe kom voor teen 'n tempo aansienlik vinniger as die van QRS-komplekse

Bestudering van die elektrokardiogram het getoon dat:

(i) P-golwe ritmies en gereeld voorkom teen 'n tempo van 240 per minuut
(ii) P-golwe nie opgevolg word deur QRS-komplekse nie en dat daar geen verband bestaan tussen P-golwe en QRS-komplekse nie
(iii) QRS-komplekse abnormaal in vorm is en voorkom teen 'n variërende tempo.

Op grond van die elektrokardiogram is 'n diagnose van volledige hartblok gemaak. Die oplossing van bradi-aritmie het ook 'n vanselfsprekende oplossing vir die ander probleme gebied. 'n Ondersoek na die konsentrasies van die ensieme kreatienkinase, laktaat dehidrogenase en hidroksibutiraat dehidrogenase het getoon dat hierdie ensiemkonsentrasies almal binne normale perke was.

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Simptomatiese behandeling met isoprenalien hidrochloried (Saventrine, Pharmax) is toegepas teen 'n mondelingse dosis van 30 mg 3-4 maal per dag. Hierdie behandeling het 'n dramatiese verbetering in die kliniese toestand van die pasiënt tot gevolg gehad. Met auskultasie is 'n meer gereelde ritme vasgestel. Met elektrokardiografiese ondersoek is 'n meer ritmiese ventrikulêre (idioventrikulêre) ritme vasgestel (Fig. 2).

Fig. 2: Ventrikulêre tagikardie

Die pasiënt is ontslaan met 'n voorskrif om isoprenalien behandeling tuis voort te sit. Die eienaar het daarmee voortgegaan vir ongeveer 2 maande, daarna behandeling gestaak en genadedood versoek.

'n Nadoodse ondersoek het dilatasie van beide ventrikels getoon asook 'n kroniese fibrineuse vegatatiewe endokarditis van die aortaklep. Knoppies, 1-2 mm in deursnee, het in beide tiroïedkliere voorgekom.

Ongelukkig is geen histopatologiese ondersoek op die hart uitgevoer nie. Die letsels in die tiroïed is histologies beskryf as 'n adenokarsinoom.

BESPREKING

Volledige of derdegraadse atrio-ventrikulêre hartblok kom voor as gevolg van totale blokkering van die elektriese impuls vanaf die sino-atriale knoop na die ventrikulêre hartspier. Blokkering van hierdie impuls ontstaan in veral 3 areas van die geleidingstelsel, nl.: in die atrio-ventrikulêre knoop, in die Bondel van His voor vertakking en in die linker- en regtervertakkings van die Bondel van His. Wanneer totale blokkering van die impuls plaasvind word artriale sametrekkings nie opgevolg deur 'n ventrikulêre sametrekking nie of atriale sametrekkings geskied nie in koördinasie met ventrikulêre sametrekkings nie. Ventrikels trek saam as gevolg van prikkeling deur 'n ektopiese pasaangeër.

Bestudering van die ritme op die elektrokardiogram het die identifisering van P-golwe en QRS-komplekse asook die bepaling van die verband tussen P-golwe en QRS-komplekse ingesluit. Die ventrikels trek saam as

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gevolg van prikkeling deur 'n ektopiese pasaangeër en daarom het die QRS-kompleks 'n abnormale konfigurasie (Fig. 1 en 2). Die vorm van die QRS-kompleks hang egter grotendeels af van die fokus van oorsprong van die elektriese impuls en daarom vertoon die QRS-kompleks nie noodwendig 'n abnormale konfigurasie nie.

Volledige hartblok word geassosieer met 'n aantal toestande[2 6 7 9 11] van die hart soos byvoorbeeld kongenitale harttoestande soos aorta-stenose, kongenitale hartblok, degeneratiewe toestande van die miokardium, bakteriese endokarditis, infarksie en neoplasie van die miokardium. Ander geassosieerde toestande waar die hart self nie noodwendig aangetas is nie, is byvoorbeeld hiperkalemie en die gebruik van geneesmiddels soos digitalis. Volledige hartblok mag ook 'n belangrike differensiële diagnose wees by die plotselinge sterftes in die hond – veral in jong honde wat ly aan hipertrofiese kardiomiopatie[8].

Met sorgvuldige auskultasie van die borskas van 'n pasiënt met volledige hartblok behoort lae toonhoogte presistoliese geluide gehoor te word teen 'n tempo wat gewoonlik die van die sistoliese geluid aansienlik oorskry[4] (presistoliese geluide word veroorsaak deur sametrekking van die atria). Prominente aritmiese polsings in die venae jugularis mag ook soms gesien word as gevolg van terugwaartse vloei van bloed vanaf die regter atrium. Hierdie golwings word veroorsaak wanneer die atria saamtrek wanneer die trikuspidale kleppe gesluit is en staan bekend as sogenaamde "kannongolwe". Die onderliggende oorsaak hiervan is ongekoördineerde sametrekking van die atria en ventrikels.

Beide kliniese tekens (hoorbare atriale sametrekkings en prominente polsings in die venae jugularis) is nie in hierdie geval klinies waargeneem nie – bes waarskynlik omdat die digte haarkleed van die pasiënt dit onmoontlik gemaak het.

Die prognose van pasiënte met volledige hartblok is gewoonlik swak. Die enigste werklik doeltreffende vorm van langtermyn behandeling is die inplantering van 'n pasaangeër[1 12]. Die geneesmiddel wat gewoonlik die beste resultate lewer is die beta-agonis isoproterenol[3 4]. Soms word ander simpatomimetiese middels ook gebruik. Die gebruik van hierdie middels veroorsaak 'n versnelling in die metabolisme van die hartspier en mag gevolglik hipoksie teweegbring. Die langdurige gebruik van hierdie middels in die mens lei soms tot langdurige aanvalle van angina[10]. In 'n noodsituasie word isoproterenol toegedien as 'n intraveneuse infusie (5 mg/mℓ) in 'n dekstrose/water oplossing teen 'n tempo wat 'n ventrikulêre sametrekkingstempo van 80 tot 120/minuut verseker. Die middel kan ook as 'n enkele bolus (0,05 mg) intraveneus toegedien word[4].

Die parasimpatolitiese middel, atropien, word soms gebruik in die korttermyn behandeling van hartblok. Toksiese dosisse (en soms selfs groot terapeutiese dosisse) mag egter ook hartblok veroorsaak[5]. Kortisone word gebruik veral wanneer vermoed word dat 'n infektiewe letsel moontlik vir die probleem verantwoordelik mag wees. 'n Relatiewe hipokalemiese toestand neig om die geleiding van impulse in die hartspier te versnel en daarom mag die gebruik van chloortiasied en natriumbikarbonaat 'n gunstige uitwerking hê in pasiënte met hartblok.

Wanneer hartblok ontstaan met die gebruik van antiaritmiese middels en digitalis, is dit logies dat hierdie middels onmiddellik onttrek moet word. 'n Hiperkalemiese toestand moet ook onmiddellik gekorrigeer word.

In die onderhawige geval is die oorsaak van die hartblok bes waarskynlik te wyte aan 'n fibrotiese letsel wat mettertyd ontwikkel het. Die pasiënt het blykbaar aanvanklik beter reageer op behandeling as wat die geval was voordat genadedood versoek is. Die tiroïed-letsel is waarskynlik 'n toevallige bevinding.

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Vier angels van rooigras is sigbaar langs die strottehoof van die lam, twee aan weerskante. Die absesse aan weerskante van die oopgesnyde slukderm is ook sigbaar.

Four *Themeda* awns are visible adjacent to the larynx of the lamb. The abscesses on either side of the longitudinally opened oesophagus are also visible.

ROOIGRAS-SAADANGELS SKEP PROBLEME BY SKAPE

Gedurende Februarie – Maart 1981 het die goeie reëns om Bloemfontein gelei tot welige groei van die rooigrasweiding en het dit vinnig en goed saad geskiet. Sodoende het hierdie uitstekende weiding tot aansienlike probleme gelei en het een boer soveel as 400 uit 2 000 lammers verloor.

Omdat sommige boere se ooie begin lam het voordat die gebruiklike groen hawer en koring beskikbaar was, het die ooie en lammers op die rooigras geloop. Die saadangels het in sagte weefsel ingedring en dikwels *Corynebacterium*-absesse tot gevolg gehad. In omtrent 90 % van die gevalle wat ondersoek is, het die angels die strotgebied ingedring en soveel as 4 angels is aangetref. Sulke lammers kon nie suip nie, het uitgeteer en van komplikasies gevrek. In 2 gevalle het die angels in die verhemelte net agter die boonste kiestande ingedring en absesse in die breinbasis veroorsaak. In een geval het die angel die slukderm ingedring en fatale bloeding tot in die rumen veroorsaak. Gevalle van septiese buikvliesontsteking en onderhuidse verswering a.g.v. *Corynebacterium*-besmetting wat op angelpenetrasie gevolg het, het ook voorgekom.

By volwasse skape het nadipvrektes voorgekom a.g.v. besmetting van die angelwonde in die vel. Die angels was soms elke 3 cm oor die hele vel versprei en ekstensiewe purulente subkutane ontsteking het ontstaan. By die abattoir is heelwat skape afgekeur of afgegradeer a.g.v. saadangels in die subkutis.

Die sade is deur die Dept. Plantkunde van die Universi-

ROOIGRAS SEED AWNS CAUSE PROBLEMS IN SHEEP

Exceptionally good rains around Bloemfontein during February – March 1981 resulted in abundant growth of rooigras (*Themeda triandra*) pastures with rapid and heavy seed formation taking place. Severe problems in sheep arose while grazing on this excellent natural pasture grass. Heavy losses were sustained and one farmer lost 400 out of 2 000 lambs.

Because some farmers had ewes lambing before the customary green wheat or oats grazing was available, the ewes and lambs were kept on rooigras grazing. The awns penetrated soft tissues and frequently resulted in *Corynebacterium* abscessation. In about 90 % of cases examined, the awns had penetrated the faucial area and as many as 4 awns were present. Such lambs could not suckle, lost condition and died from various complications. In 2 instances the awns penetrated the palate just posterior to the upper molar teeth to cause brain-base abscessation. In one case an awn penetrated the oesophagus and caused fatal haemorrhage. Cases of septic peritonitis and subcutaneous abscessation due to *Corynebacterium* also occurred.

In adult sheep there were post-dipping losses due to contamination of the skin wounds caused by the awns. In some instances awns were spaced about every 3 cm throughout the skin and extensive purulent subcataneous inflammation was encountered. At the abattoir, condemnation and downgrading of slaughtered sheep due to awn penetration added to the farmers' loss.

The seeds were identified as those of *Themeda trian-*

teit van die Oranje-Vrystaat as die van *Themeda triandra* uitgeken. Die angels is higroskopies, draai wanneer hulle nat word en word weer reguit wanneer hulle droog word, die angel kan dus indring sonder dat dit aan iets vas is.

Daar word aanbeveel dat ooie slegs toegelaat word om te lam op rooigras wat kortgevreet is.

Ingestuur deur: Dr. J.A.L. de Wet, Veeartsenylaboratorium, Afd. Veeartsenykunde, Dept. Landbou, Posbus 502, 9300 Bloemfontein.

dra by the Dept. of Botany of the University of the Orange Free State. The awns are hygroscopic; they rotate when wet and straighten when dry so that they easily penetrate tissue.

Farmers are advised to allow ewes to lamb in rooigras camps only when the grass has been grazed down.

Submitted by: Dr J.A.L. de Wet, Veterinary Laboratory, Division of Veterinary Science, Dept. of Agriculture, P.O. Box 502, 9300 Bloemfontein.

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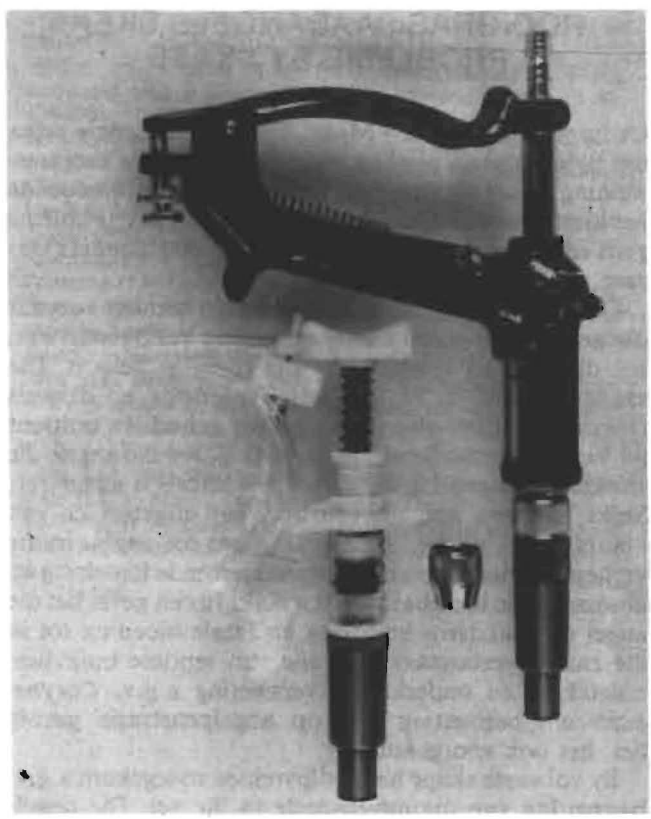

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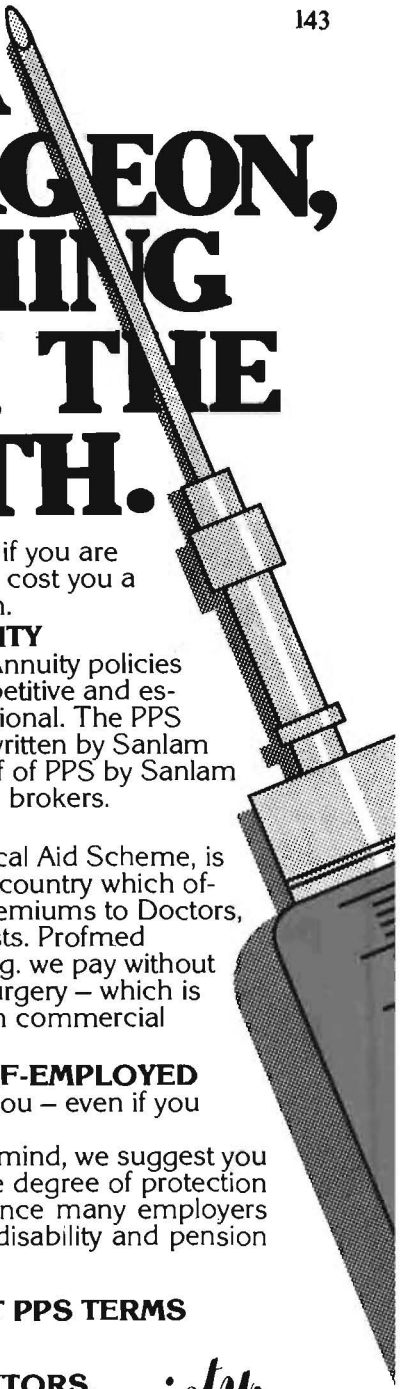

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